STATE OF WASHINGTON

aquatic plant management program

FINAL ENVIRONMENTAL IMPACT STATEMENT

SEATTLE DISTRICT
U.S. ARMY CORPS OF ENGINEERS

OCTOBER 1979

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AQUATIC PLANTS
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WEED CONTROL
WASHINGTON (STATE)
LAKE UNION
EURASIAN WATERMILFOIL
LAKE WASHINGTON
LAKE SAMMAMISH

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

A program for the management of the nonnative aquatic plant Eurasian watermilfoil (Myriophyllum spicatum L.) is proposed for waters within the State of Washington. The proposed program is designed to prevent the spread of milfoil to uninfested navigable waters and to control existing milfoil growth at high-use public areas in navigable waters. Monitoring of any proposed chemical treatment methods utilized and evaluation of the overall

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effectiveness of the Aquatic Plant Management Program are incorporated as project features. Treatment methods which are acceptable for use in prevention and control operations are:

(1) Prevention - Rotovating, hand removal, suction dredging, frament barriers, or the herbicide 2,4-D. (Aerial surveillance, ground surveillance, and public information will also be utilized by the prevention program).

(2) Control - Mechanical harvesting, fiberglass bottom screens, 2,4-d, endothall, diquat, or dichlobenil.

The methods or combination of methods that may be utlized are specific to each site proposed for treatment and would be determined by the local sponsor.

"Original contains color plates: All DTIC reproductions will be in black and white"

FINAL

Environmental Impact Statement

State of Washington

Aquatic Plant Management Program

Prepared by

U.S. Army Corps of Engineers District
Seattle, Washington

ERRATA SHEET

page 12B Table 2 Alternate Treatment Methods

To the regulatory requirements for 2,4-D (DMA & BEE)), endothall, diquat, and dichlobenil add the statement, "May require Department of the Army permit."

The regulatory requirements for harvesters and hand removal should be corrected to say, "May require Department of the Army permit."

The regulatory requirements for rotovators and suction dredge should be corrected to say, "Would require Department of the Army permit due to the alteration of the bottom."

STATE OF WASHINGTON
AQUATIC PLANT MANAGEMENT PROGRAM

( )Draft (X)Final Environmental Statement

Responsible Office: U.S. Army Engineer District, Seattle, Washington

1. Name of Action: (X)Administrative ( )Legislative

2. Description of Action: A program for the management of the non-native aquatic plant Eurasian watermilfoil (*Myriophyllum spicatum* L.) is proposed for the State of Washington. The proposed plan consists of a prevention and a control program. The prevention program is designed to prevent the spread of Eurasian watermilfoil into navigable waters within the state and will be initially concentrated in the Okanogan area. Features of the prevention program are surveillance (aerial and ground), spot treatment, public awareness, training, monitoring, and program evaluation. Treatment methods acceptable under the recommended plan are rotovating, suction dredging, hand removal, and application of the herbicide 2,4-D. Fragment barriers will be used to intercept milfoil fragments floating downstream. The control program is designed to reduce milfoil growth in approximately 100 acres of Lakes Washington, Union, and Sammamish in western Washington where it is obstructing recreational use. Treatment methods acceptable under the recommended plan are mechanical harvesting; fiberglass bottom screens; and the herbicides 2,4-D, diquat, endothall (dipotassium salt), or dichlobenil. The selection of treatment methods for individual sites will be the responsibility of the local sponsor.

a. Environmental Impacts: The primary impacts resulting from the proposed plan would be a reduction in obstructions to water-related recreation on Lakes Washington, Sammamish, and Union and in the spread of milfoil to presently uninfested waters.

b. Adverse Environmental Effects: Adverse effects of chemical control of Eurasian watermilfoil include temporary degradation of water quality from the chemical and the decomposition of the dead aquatic plants, buildup of organic bottom sediment, possible damage to fauna and nontarget flora, loss of habitat, possible algal blooms caused by nutrient release from plant decomposition, temporary restriction on the use of the water by the public, and human exposure to potentially hazardous chemicals.

Mechanical control measures would adversely affect noise levels and air quality. Other adverse effects would include loss of habitat and the destruction of nontarget flora and fauna.

3. Alternatives to the Proposed Action: Alternative prevention and control programs considered were no action and total eradication of milfoil. Alternative treatment methods evaluated were dredging; hydraulic washing; water level fluctuations; the chemicals simazine, silvex, fenac, and endothall (DMA salt); and herbivorous fish, insects, and pathogens.

4. Comments Received from Public Review of the Draft Environmental Impact Statement:

Debbie Powell	Undated
U. S. Department of Interior	23 Jul 79
Okanogan County	23 Jul 79
Washington State Parks and Recreation Commission	25 Jul 79
Mike McPhail	27 Jul 79
Municipality of Metropolitan Seattle	3 Aug 79
Advisory Council on Historic Preservation	6 Aug 79
City of Kirkland	9 Aug 79
Gil Zemansky	10 Aug 79
U. S. Department of Housing and Urban Development	15 Aug 79
Pennwalt Corporation	20 Aug 79
Mike McPhail	20 Aug 79
City of Bellevue	23 Aug 79
U. S. Department of Health, Education, and Welfare	27 Aug 79
Aquatic Control	28 Aug 79
Washington Staff Office of Archeological and Historic Preservation	28 Aug 79
Howard Millan	29 Aug 79
City of Seattle	29 Aug 79
Robert Dahl	30 Aug 79
U. S. Environmental Protection Agency	30 Aug 79
Washington State Department of Ecology	31 Aug 79
Washington State Department of Ecology	31 Aug 79
Washington State Department of Fisheries	20 Aug 79
Washington State Department of Game	23 Aug 79
Washington State Department of Natural Resources	20 Aug 79
Washington State Department of Transportation	21 Aug 79
Greenpeace - Seattle	Undated
Walbridge Powell	3 Sep 79
Seattle Audubon Society	13 Sep 79
Sierra Club - Cascade Chapter	5 Sep 79
Washington State Department of Game	11 Sep 79
Washington Environmental Council (Seattle)	13 Sep 79
Washington Environmental Council (Grant County Chapter)	13 Sep 79
Mr. and Mrs. William Favro	14 Sep 79
Friends of the Earth	14 Sep 79
U. S. Department of Interior	17 Sep 79
Yakima County Audubon Society	15 Sep 79
King County	20 Sep 79
Friends of the Earth	25 Oct 79
Municipality of Metropolitan Seattle	25 Oct 79
Seattle Audubon Society	26 Oct 79
Citizens Against Toxic Herbicides	Undated

5. Draft Statement Listed in Federal Register on: 27 July 1979

Final Statement Listed in Federal Register on:

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1. PROJECT DESCRIPTION

1.01 General. A program for the management of the nonnative aquatic plant Eurasian watermilfoil (*Myriophyllum spicatum* L.) is proposed for waters within the State of Washington. The proposed program is designed to prevent the spread of milfoil to uninfested navigable waters and to control existing milfoil growth at high-use public areas in navigable waters. Monitoring of any proposed chemical treatment methods utilized and evaluation of the overall effectiveness of the Aquatic Plant Management Program are incorporated as project features. Treatment methods which are acceptable for use in prevention and control operations are:

- Prevention - Rotovating, hand removal, suction dredging, fragment barriers, or the herbicide 2,4-D. (Aerial surveillance, ground surveillance, and public information will also be utilized by the prevention program.)

- Control - Mechanical harvesting, fiberglass bottom screens, 2,4-D, endothall, diquat, or dichlobenil.

The methods or combination of methods that may be utilized are specific to each site proposed for treatment and would be determined by the local sponsor.

If the performance of the Aquatic Plant Management Program is limited by funding, time, or manpower, the work proposed under the prevention program will be given higher priority for accomplishment than work proposed under the control program.

The Washington State Department of Ecology has agreed to act as "umbrella" sponsor for the program, coordinating with local and state agencies to select treatment methods and provide cost-share funding.

1.02 Study Authorization. Aquatic plant management projects were originally authorized by the River and Harbor Act of March 3, 1899, Chapter 425, Section 1. Many amendments have been made to the original authorization reflecting the changing needs of the public. Public Law 89-298, Section 302, of the River and Harbor Act of 1965 was approved on 27 October 1965 and referred to as the "Aquatic Plant Control Program." The Act authorized a comprehensive program for the control and progressive eradication of obnoxious aquatic plant growths from the navigable waters, tributary streams, connecting channels, and other allied waters of the United States in the combined interest of navigation, flood control, drainage, agriculture, fish and wildlife conservation, public health, and related purposes. Existing Federal project areas cannot be included as part of any management program developed under this authority.

On 4 August 1977, the Washington State Department of Ecology (WDE) requested Corps of Engineers' assistance in the development of an aquatic plant management program for Washington State. Technical data were developed through field investigations, recreational and property value analyses, inventory of environmental base conditions,

assessment of program impacts, fish and wildlife studies and site analyses, and from other aquatic plant management programs in the United States and Canada.

1.03 Target Species: Eurasian Watermilfoil.

1.03.1 Biology and History of Spread. Eurasian watermilfoil is a submersed aquatic angiosperm native to Europe, Asia, and parts of Africa. It is able to reproduce by seeds, but is more commonly spread vegetatively throughout the year by rhizomes, fragmented stems, and auxiliary buds. It has long, branching stems which often form extensive mats on the water surface (Reed, 1977).

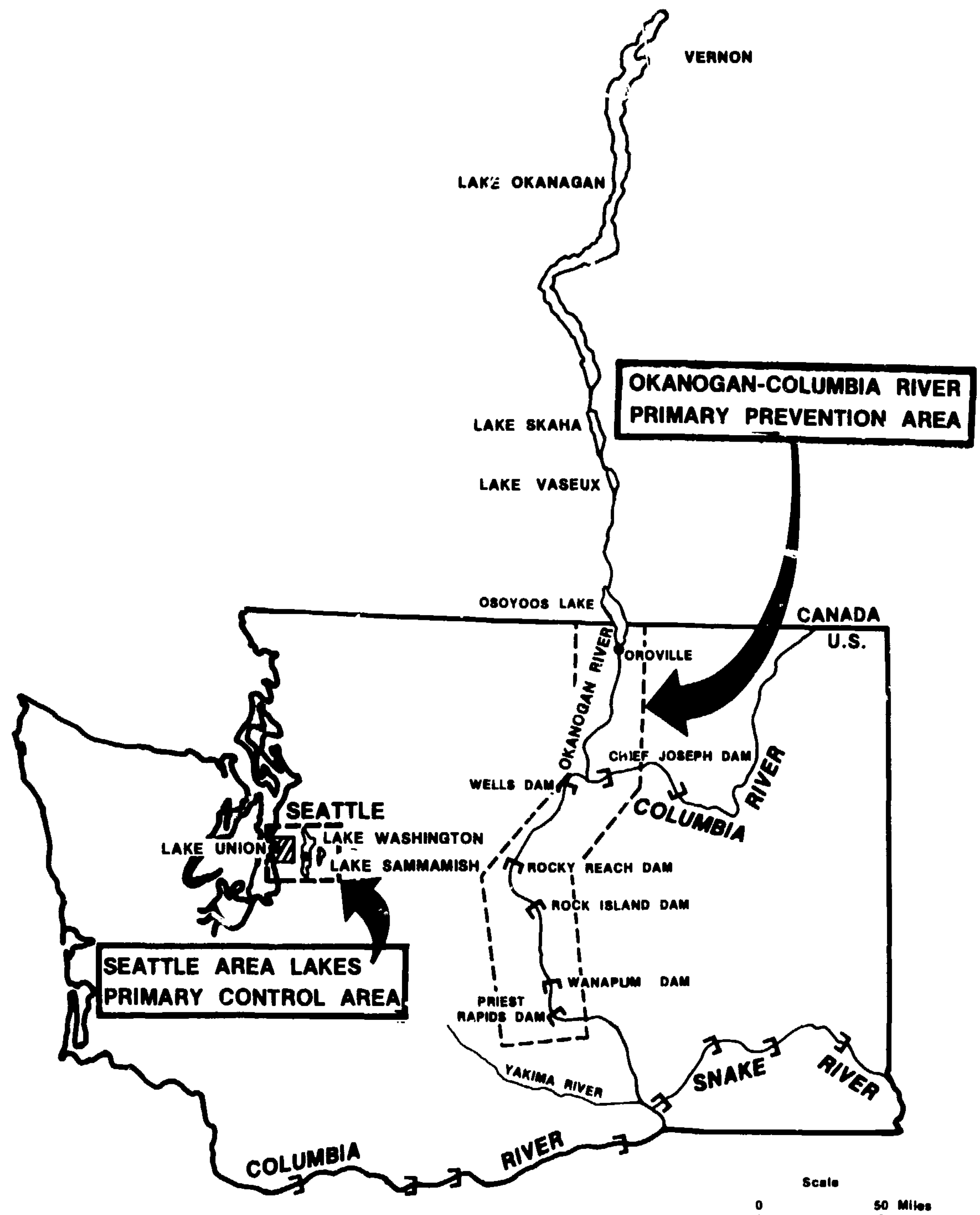
Eurasian watermilfoil was first described by Linnaeus in 1753 in his *Species Plantarum*, based on European specimens. In 1919, Fernald indicated that the American population of watermilfoil differed significantly from European populations. He named the American watermilfoil *Myriophyllum exalbescens*. The proper taxonomic relationship between *M. spicatum* and *M. exalbescens* has not been completely resolved. The two plants have been treated as varieties, subspecies, as a single species, and as separate species (Reed, 1977; Grace and Wetzel, 1978).

The Terminology Committee of the Weed Society of America has given approval to common names of Eurasian watermilfoil for *M. spicatum* and northern watermilfoil for *M. exalbescens* (Klingman, 1962).

The similarity of *M. exalbescens* and the confusion in classification make it difficult to pinpoint Eurasian watermilfoil's introduction into the United States. *M. spicatum* was noted in North America as early as 1848 by Asa Gray, but could have been confused with *M. exalbescens*. It is thought that *M. spicatum* (hereafter to be referred to as milfoil) was first introduced between 1880 and 1890 when ships coming from Europe dumped their ballast (Beaven, 1962).

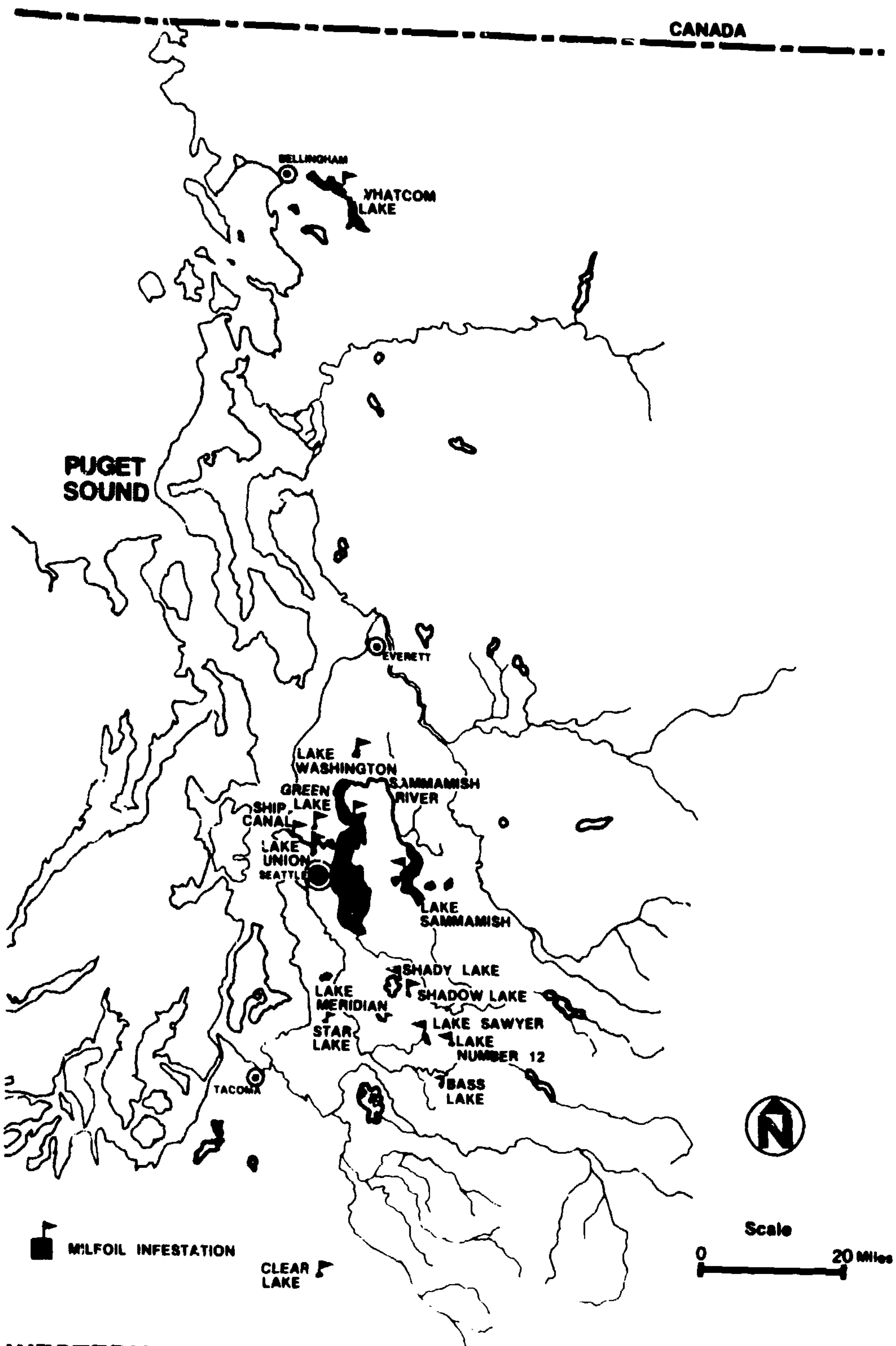
Milfoil was found sporadically along the east coast until 1954 when it began rapid growth and expansion (Stevenson and Confer, 1978). It became a serious problem in Chesapeake Bay and spread to North Carolina, Florida, Texas, Oklahoma, the Tennessee Valley, Canada, and westward to California and Washington. The spread is thought to have been aided by direct waterflow, the aquarium trade, waterfowl movement, and by recreational boating causing fragmentation and transporting fragments from water body to water body.

The first suspected occurrence of milfoil in the Seattle area was in Lake Sammamish in 1974. Problems began developing in Union Bay, Lake Washington, in 1975. The problem plant was positively identified as *Myriophyllum spicatum* in 1976. Milfoil was also identified in several small lakes in the Seattle area in 1976 and in eastern Washington (see figures 1, 2, and 3). (Note: The Bureau of Reclamation reservoirs and waterways are authorized Federal projects and are, therefore, not eligible for treatment under the proposed Aquatic Plant Management Program.)



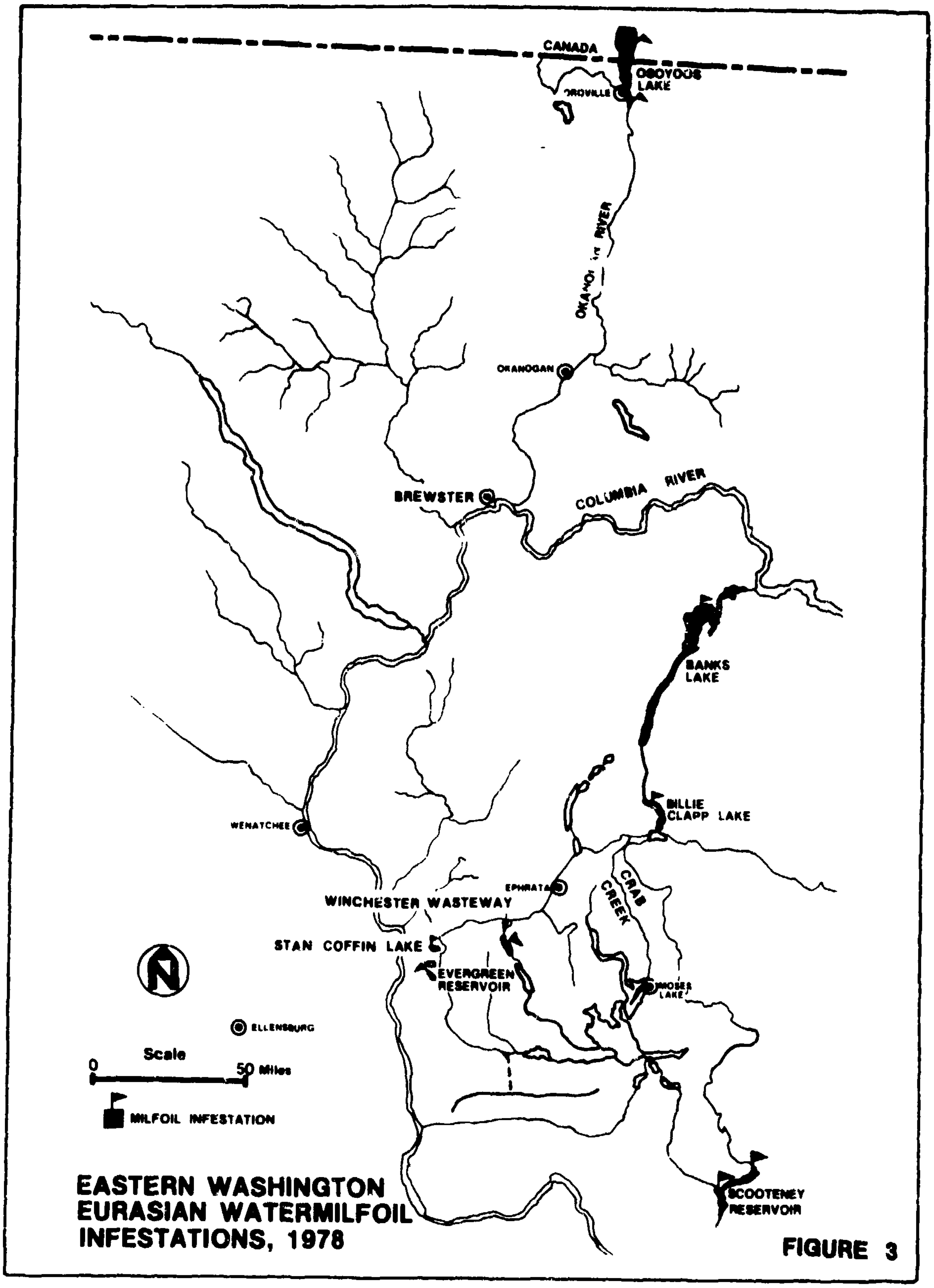
STATE OF WASHINGTON
AQUATIC PLANT MANAGEMENT PROGRAM PROJECT AREAS

FIGURE 1



WESTERN WASHINGTON EURASIAN WATERMILFOIL INFESTATIONS, 1978

FIGURE 2



EASTERN WASHINGTON
EURASIAN WATERMILFOIL
INFESTATIONS, 1978

FIGURE 3

1.03.2 Value of Aquatic Vegetation. In a balanced system, aquatic macrophytes perform many valuable functions. They provide food, cover, and attachment area for many aquatic organisms; provide shore erosion protection; reduce turbidity by consolidating bottom sediments; inhibit algal blooms by reducing the amount of available nutrients in the water; and increase dissolved oxygen levels through photosynthesis. Species composition is a result of competition for space, light, and nutrients; predation; and interactions with parasites and pathogens (Wagner, 1974).

1.03.3 Introduction of Nonnative Species. When a nonnative species is introduced, it will die out immediately if conditions are unfavorable. If, however, the new habitat is a reasonable facsimile of its native habitat, the introduced species may become established by filling an unoccupied niche or by outcompeting a native species for its niche. Without natural controls, the population may rapidly expand (Wagner, 1974).

The interrelationships in a stable ecosystem are developed over long periods of time and are quite conservative. Gradually, however, predator-prey relationships form and the species is absorbed by the environment. The period of absorption, however, may take hundreds of years (Wagner, 1974). It is impossible to tell where milfoil is in this absorption process, but population declines in Chesapeake Bay (Elser, 1969) and the recent discovery of heavy milfoil grazing by a snail of the genus Physa in British Columbia (Kangasniemi, 1978) are encouraging.

1.03.4 Impacts of Milfoil. The principal environmental impacts of milfoil are caused by sheer biomass rather than the presence of the species. Dense populations of milfoil have many physical effects on water bodies. They tend to speed aquatic plant succession which contributes to the "aging" of lakes (Ashby, 1969).

Vigorous plant populations may occupy up to 10 percent of the total volume of a river. This could reduce the maximum velocity of the current by more than 25 percent of normal, causing the river to rise nearly one-half inch per day to as much as 30 inches above the normal level (Hillebrand, 1950). This has serious implications for flood control and for irrigation projects.

Dense populations of milfoil effectively eliminate recreational boating and swimming in shallow areas and obstruct fishing. (The period of obstruction to recreation is dependent upon local conditions.) Milfoil in the Tennessee Valley system has also clogged municipal water intakes, caused less efficient operation of power generators, and displaced valuable waterfowl food species (TVA, 1972).

Stands of milfoil reduce current velocity, causing an increase in the rate of sedimentation and further accelerating the establishment of densely colonized silt beds. The reduced velocity decreases water aeration, which may reduce the immediate oxygen supply and increase

the water temperature in shallow areas (Sculthorpe, 1967). The reduced flow also allows greater heating of the water by solar radiation, increasing shallow water temperature significantly (Young, 1973). Thus, dense stands of milfoil may perpetuate their own growth and spread by slowing water currents sufficiently to increase both sedimentation and insulation effects within the stand, resulting in rapid substrate accumulation and water temperature increases up to 4° C above normal levels (Young, 1973).

A beneficial physical effect of milfoil is that it tends to reduce turbidity by consolidating bottom sediments. Biologically, this also facilitates colonization by benthic algae and invertebrates. Its foliage offers shelter, support, and oxygen enrichment to a rich and varied epiphytic microflora and fauna (Sculthorpe, 1967). The average biomass of animals per unit area of submerged plant may be three or four times greater than that on silt and 15 times greater than that on rock or gravel (Needham, 1938).

Heavy concentrations of milfoil can have an adverse effect on dissolved oxygen concentrations. Normal circulation of water can be severely restricted, causing subsurface water to stagnate for long periods, resulting in oxygen depletion at the lower levels (Fish, 1966). Nighttime respiration can also seriously deplete the oxygen supply when added to the biological oxygen demand caused by the decomposition of plant materials (Sculthorpe, 1967). The net result of the lowered level of dissolved oxygen could be the reduction of benthic invertebrates and fish kills.

Besides adding to the biological oxygen demand, large mats of drifting milfoil build up on beaches where they decompose, causing a further deterioration of water quality and a nuisance to shoreline property owners and public beaches. This buildup and decomposition, besides having an adverse esthetic effect, has impacted tourism in some areas of British Columbia.

Concerns have been expressed that the dense populations of milfoil would have adverse effects on waterfowl because of the potential elimination of traditional food sources. Martin et al. (1951) rated _Myriophyllum spicatum_ along with _M. verticillatum_ and _M. heterophyllum_ as low-grade duck foods, accounting for less than 5 percent of waterfowl diet. A digestive tract analysis of several waterfowl species done by Florshutz (1973) between 1968 and 1971 in Virginia and North Carolina, however, showed Eurasian watermilfoil to be an important food source for some species of overwintering waterfowl. The sampling was done in areas of heavy milfoil infestation and indicates that there is some flexibility in waterfowl feeding habits. Stevenson and Confer (1978), in an analysis of species population trends and feeding habits of waterfowl in Chesapeake Bay, state that milfoil infestation has resulted in a decrease of traditional food sources. Some waterfowl species have declined as a result, but several have adapted to alternate food sources.

There are also differing views concerning the effects of milfoil on fisheries. The North Carolina Department of Natural and Economic Resources (1974) states: "The one clear value of milfoil growth in Currituck Sound, North Carolina, is that it enhances sport fishing. The plant provides a substrate for many invertebrate animals upon which many forage and game fishes feed. The shelter provided by the weed beds promotes great expansion of the forage fish populations utilized by prized game fishes. The weed-bed margins provide many lineal miles of ideal 'edge effect' fishing." Frye (1972) and Thompson and Hartwig (1973) dispute this view, stating that dense milfoil populations provide excessive shelter for small fish which impacts the predator-prey relationship to the point that game fish are stunted.

When milfoil reaches the water surface in late summer, it creates a quiet water area which provides a good mosquito breeding area and also tends to collect debris, further impacting esthetics.

1.03.5 Environmental Factors Affecting Milfoil Growth. Like all aquatic plants, milfoil has several requirements for growth. Its parameters for optimum growth are not fully understood and, since it is a very recently introduced species to Washington, most of the literature dealing with its requirements are from other parts of the country.

1.03.5.1 Substrate. Milfoil seems to be able to grow in a wide range of substrate types. Young (1973) reported dense stands in gravel, sand, and silt in Melton Hill Reservoir, Tennessee. Milfoil is also capable of invading hard sand if other factors are favorable (Steenis and Stotts, 1961). Generally, however, coarse substrates in lakes are devoid of submerged vascular plants unless finer sediments are trapped between fragments providing a rooting medium (Sculthorpe, 1967). Patten (1956) correlated milfoil density to substrate particle size. Maximum density coincided with fine organic ooze, while minimum density was found in sand.

1.03.5.2 Nutrients. Grace and Wetzel (1978) stated that milfoil seems to be successful because of its ability to avoid nutrient limitations, especially of nitrogen and phosphorus. Milfoil can take these nutrients out of the water through its foliage and can also take them from the sediments through the roots.

Another reason milfoil is able to avoid nutrient limitations is its low requirements. Gerloff (1975) found that the critical concentrations of nitrogen, phosphorous, and potassuim, the minimum concentrations in a plant which will permit maximum growth, is much lower in milfoil than other macrophytes tested.

Most of the lesser nutrient requirements have not been tested in relation to milfoil growth and reproduction. Stanley (1970), however, found that calcium is required at concentrations greater than 1 mg per liter for maximum photosynthesis. He also found that the

uptake of phosphate is correlated with the calcium concentration in the water. Total exclusion of calcium prevented phosphate uptake by roots and severely reduced uptake by stems and leaves.

1.03.5.3 Available Light (a Function of Water Depth and Turbidity). The maximum milfoil biomass will be in a zone which is deep enough to accommodate luxuriant growth and shallow enough to allow sufficient light for photosynthesis (Grace and Wetzel, 1978). The maximum depth of milfoil growth is subject to the turbidity of the water. Suspended particles and algal growth are two factors which will increase turbidity and, therefore, decrease light penetration.

Milfoil has an advantage in the deeper waters of the littoral zone because of its low light compensation point, the point at which oxygen used for respiration equals that produced by photosynthesis (1 to 2 percent of surface light) (Grace and Wetzel, 1978).

Root initiation and growth of milfoil are dependent upon light, auxin, and nutrient interactions (Stanley, 1970). Stanley also found that light promoted root initiation but not root growth and that maximum root growth occurred in 200 parts per billion (ppb) indole acetic acid (an auxin).

Young (1973) found the maximum standing crop of milfoil to be between 5 and 6 feet in depth in a Tennessee Reservoir where the water was very turbid.

Peltier and Welch (1970) suggested that variability of aquatic plant problems may be caused by the variation of available light during the critical growing period (April and May). Their study in Pickwick Reservoir, on the Tennessee River, ranged over 8 years. They found a direct correlation between the amount of rainfall and the depth of the photic zone independent of nutrient availability. The increased runoff caused increased turbidity and a decrease in the depth of the photic zone. The years of the greatest plant problems in the reservoir corresponded with the years of least rainfall and resulting turbidity during the critical growing period. Also contributing to differing levels of light availability in the study were water releases from an upstream dam and water elevation variations in the reservoir.

1.03.5.4 Waterflow and Turbulence. Slow moving or stagnant waters tend to have a stable bottom covered by sand, clay, or mud and tend to support a rich flora of higher plants. Running water is characterized by lower temperatures and a comparative absence of humus, detritus, and plankton. Besides the lack of suitable substrate, vascular plants have a complexity of organization that cannot withstand the stress of rapidly moving water (Needham and Lloyd, 1930).

Wave-washed areas, and areas of fluctuating water levels, usually have very little plant growth (Reid, 1961). Severe wave action limits milfoil establishment, but once established, milfoil tends to reduce wave effects (Stotts, 1961).

Some movement is needed to exchange water at the leaf surface where bicarbonate carbon sources and nutrients supplies are absorbed and become depleted (Westlake, 1967).

1.03.5.5 Temperature. Young (1973) noted that water temperatures in Melton Hill Reservoir, Tennessee, did not limit the distribution of milfoil, but did influence the metabolism, vegetative reproduction, fruit development, and abundance of the plant. Plant stands in water between 19° and 26° C reached the water surface in June and flowered in July. Stands in water between 9° and 15° C reached the surface in August and flowered in September.

Young also noted an apparent relationship between temperature stability and plant density, with standing crops increasing as daily temperature fluctuations decreased.

The optimum temperature for milfoil photosynthesis is 35° C (Van et al., 1976), but the optimum temperature for growth is probably much lower. Milfoil has been documented growing in waters from 0.1° to 30° C (Anderson, 1964; Anderson et al., 1965). Titus et al. (1975) determined that a 10° C increase in temperature stimulated a 10 percent increase in the peak standing crop. Grace and Tilly (1976), however, found productivity to decrease at temperatures above 24° C.

Increase in temperature from 11° to 26° C greatly increases rates and amounts of nutrient absorption and translocation in milfoil as shown by radioisotope uptake (Young, 1973).

1.03.5.6 PH and Alkalinity. Optimal milfoil growth occurs in water of high pH and high conductivity. The usual distribution of milfoil in hard, alkaline water may be correlated with the plant's capacity to utilize bicarbonate as a major carbon source in photosynthesis (Nielsen, 1956; Spence, 1967).

Net photosynthetic CO_2 uptake in milfoil is pH dependent. Optimal photosynthetic rates were obseved at pH 8.4 and decreased at pH 10 due to the lack of free CO_2 and bicarbonate (Stanley, 1970).

PH is a limiting factor in soft water, but milfoil can grow well when both pH and calcium levels are low if there is no intraspecific competition (Hutchinson, 1971).

Milfoil failed to survive in a Tennessee Valley pond where the alkalinity was less than 20 mg of calcium bicarbonate per liter (Smith, 1971).

1.03.5.7 Salinity. Milfoil can tolerate tidal waters with salinity up to 16 parts per thousand (ppt) which is about 46 percent sea salinity. It roots best at 3.5 ppt (10 percent sea salinity) (Reed, 1977). Boyer (1960), in laboratory studies, showed that inhibition started at 10 ppt and became severe at 15 to 20 ppt.

Leaf area and stem diameter were found to decrease as salinity increased. Flowering decreased and it was delayed or nonexistent at higher salinities. As salinities increased above 15 ppt, stems broke near the substrate and large floating mats of decaying plant material were formed (Anderson, 1964).

1.03.6 Potential for Milfoil Growth. Using measurements of light penetration, water quality, and sediment characteristics, a field team from the Corps' Waterways Experiment Station (WES) concluded that a high potential existed for the expansion of milfoil in presently infested lakes and for eventual milfoil expansion into currently uninfested areas. Based on their study results, WES made the following projections of potential maximum milfoil growth in selected water bodies:

TABLE 1

Water Body		Milfoil Potential for Growth
Lake Washington		3,930
Lake Union		180
Lake Sammamish		690
Osoyoos Lake		550
Okanogan River		440
Columbia River		106,750
	Total	112,540

1.04 Alternative Treatment Methods. Treatment methods given extensive review for possible use in an aquatic plant management program are shown in table 2 and summarized below. Detailed cost breakdowns for mechanical harvesting, fiberglass bottom screens, and chemical treatment alternatives are provided in appendix A.

1.04.1 Mechanical Harvesting. Mechanical harvesting entails cutting aquatic vegetation 5 to 8 feet below the water surface and removing the cut vegetation from the water. The root systems are not affected, so the plants continue to grow. There are several different types of harvesters available, from large units which automatically pick up the cut plants to small cutter boats which require hand pickup. Because milfoil is spread by fragmentation, harvesting can speed its dispersal. Containment booms are often used around the treatment areas to minimize floating fragments, but they are not 100 percent effective. For these reasons, mechanical harvesting should be limited to areas which do not require complete control and do not directly threaten uninfested waters.

Another problem associated with harvesting milfoil is upland disposal. Transport and handling are expensive, and many attempts that have been made to find a use for the harvested milfoil, to partially defray the cost, have been unsuccessful. However, the cost of disposing of harvested milfoil may be reduced because of the compost value of the material. For example, preliminary tests indicate that milfoil can be composted for use as growth media in greenhouses (Wile et. al., 1978).

Anderson et al. (1955) analyzed the mineral composition of milfoil to determine if it could be used as a supplement or substitute for commercial fertilizer. Freshwater and estuarine samples from Chesapeake Bay were analyzed. The conclusion reached was that milfoil would not be an economically feasible substitute for commercial fertilizer due to an 85 to 95 percent loss in weight upon drying and an N-P-K (Nitrogen-phosphorous-potassium) value of only 3-2-5 (percent dry weight).

Boyd (1968) analyzed several aquatic macrophytes to determine their potential for use as forage. He found that many species, including milfoil, have a high percentage of crude protein, but were generally low in fiber value. The cost of harvesting, drying, and transporting appear to limit commercial use of aquatic plants for forage.

Attempts were made to utilize milfoil as a source of xanthophyll in chicken feed, but the xanthophyll derived from it was very unstable and the meal made from milfoil pigmented broilers (Smith, 1971).

The estimated cost/acre of mechanical harvesting (assuming two cuttings per year), including disposal, is $920.

1.04.2 Rotovating. Rotovating involves "tilling" the bottom sediments to a depth of 6 inches to dislodge plant roots. The plant parts float to the surface and are then removed. The treatment area is surrounded by containment booms to prevent the spread of fragments. This method is not 100 percent effective because all of the plants do not float, nor are they always completely removed.

Because of the environmental disruption caused by rotovating, it should be used only when complete removal of the plant is required, when the treatment area is too large for either hand pulling or a suction dredge, and when herbicide application is not possible.

A definite cost per acre for rotovating has not been established. Based upon the Canadian Aquatic Plant Management Program, costs in the range of $600 to $700 per acre, plus capital cost ($50,000), could be expected.

1.04.3 Suction Dredge. The suction dredge involves the use of a small barge or boat equipped with compressors and suction hoses. The suction hoses are small and are controlled by divers who use them to remove individual milfoil plants, roots and all. The plant parts are carried through the hoses to a holding basket on the barge which separates the plants from the water and sediment. The water is discharged, along with the sediment, to the water body.

Because of the high cost and the limited amount of area which can be treated, the suction dredge is feasible only for small areas which require complete milfoil removal, are too large for hand removal, and cannot be treated with a herbicide.

TABLE

CONSIDERATIONS		CHEMICAL: 2, 4-D (DMA & BEE)	ENDOTHALL *	DIQUAT	DICHLOBENIL	HARVEST
FRAGILE OR SENSITIVE ECOSYSTEMS	Advantages	Aquatic plant species diversity is not greatly reduced after treatment. No disruption of substrate. Selective for milfoil.	No disruption of substrate.	No disruption of substrate.	No disruption of substrate.	Area of treatment trolled (no impact target area). No ruption of substr
	Disadvantages	Possible impacts with repeated use. Drift may affect nontarget areas.	It is a non-selective herbicide that will destroy many nontarget species and eliminate habitat and cover for a variety of aquatic organisms. Drift may affect nontarget areas.	It is a non-selective herbicide that will destroy many nontarget species and eliminate habitat and cover for a variety of aquatic organisms. Drift may affect nontarget areas	It is a non-selective herbicide that will destroy many nontarget species and eliminate habitat and cover for a variety of aquatic organisms. Drift may affect nontarget areas.	Non-selective, al habitat, food and a variety of aqua organisms.
POTABLE WATER SUPPLY	Advantages	Rapid breakdown results in no long-term interruption of water use.	None.	None.	None.	Minimum disruption water quality.
	Disadvantages	Before use laboratory analysis necessary to insure concentration is within allowable limits (0.1 pps)	Cannot use treated water for 7 days after application.	Cannot use treated water for 14 days after application.	Cannot be used in potable water supplies.	None.
IRRIGATION WATER SUPPLY	Advantages	Will reduce clogging of intake structures.	Will reduce clogging of intake structures.	Will reduce clogging of intake structures.	Will reduce clogging of intake structures.	Does not disrupt irrigation water.
	Disadvantages	Irrigation with treated water may result in damage to agricultural crops. Restrictions in use near intakes	Cannot use treated water for 15 days after application.	Cannot use treated water for 10 days after application.	Cannot be used if water is used for food crops. Not recommended for other irrigated applications.	None.
FISHERIES	Advantages	Concentration level needed to control milfoil is below the toxicity of most fish species.	Concentration level needed to control milfoil is below the toxicity of most fish species.	Concentration level needed to control milfoil is below the toxicity of most fish species.	Concentration level needed to control milfoil is below the toxicity of most fish species.	No possible chron
	Disadvantages	Toxicity to some species is unknown. May have chronic effects with repeated use.	Toxicity to some species is unknown. May have chronic effects with repeated use.	Toxicity to some species is unknown. May have chronic effects with repeated use.	Toxicity to some species is unknown. May have chronic effects with repeated use.	May have some eff non-selective loss aquatic vegetation direct kill of sma during harvesting.
WILDLIFE	Advantages	Acute mammalian and avian toxicity very low, non-bioaccumulative. Does not destroy most native vegetation.	Non-bioaccumulative. Concentration level needed to control milfoil is below the toxicity of most mammalian and avian species.	Non-bioaccumulative. Concentration level needed to control milfoil is below the toxicity of most mammalian and avian species.	Non-bioaccumulative. Concentration level needed to control milfoil is below the toxicity of most mammalian and avian species.	No possible chronic impacts.
	Disadvantages	May have chronic toxic effects with repeated usage.	May have chronic toxic effects with repeated usage.	May have chronic toxic effects with repeated usage.	May have chronic toxic effects with repeated usage.	May have minor eff wildlife due to selective loss of vegetation.
PERFORMANCE (EFFECTIVENESS)	Advantages	Quickly kills roots as well as stems at concentrations that are not harmful to most other desirable species.	Very effective in controlling milfoil.	Very effective in controlling milfoil.	Very effective in controlling milfoil. Systemic - will cause some root kill.	Very effective in weed stems to depth feet. Immediate few changes to wat column or bottom.
	Disadvantages	Area can be reinfested by fragments from outside the treatment area due to short persistence in water column. Application rate important (too little stimulates growth) (too much kills only stems and leaves).	Contact herbicide, kills stems only. Plants will grow back in 6 months to 1 year.	Contact herbicide, kills stems only. Plants will grow back in 6 months to 1 year.	Most plants will grow back in 6 months to 1 year.	Regrowth to surfac ible within 1 month spread of fragment ulates regrowth of Shore disposal of weeds.
ECONOMIC (COST)		2,4-D (DMA) $770/acre. 2,4-D (BEE) $760/acre.	liquid $960/acre. granular $1,470/acre	$790/acre.	$1,265/acre.	$920/acre includes two cutti

*DIPOTASSIUM SALT

TABLE 2 ALTERNATIVE TREATMENT METHODS

MECHANICAL				ENVIRONMENTAL MANIPULATION		BIO
HARVESTERS	ROTOVATORS	SUCTION DREDGE	HAND REMOVAL	BOTTOM SHADING	WATER LEVEL FLUCTUATIONS	HERBIVOROUS FISH
Area of treatment is controlled (no impact to non-target area). No disruption of substrate.	Area of treatment is controlled (no impact to non-target area). No disruption of substrate.	Very selective in treatment area and somewhat selective in plant removal.	Very selective for treatment area.	Very selective for treatment area.	None.	None.
Non-selective, eliminates habitat, food and cover for a variety of aquatic organisms.	Dislodges and exposes benthic organisms. Non-selective removal of vegetation.	Non-selective loss of vegetation in turbid waters.	None.	Disruption of benthic communities.	Dewatering of the shore zone would kill aquatic plants, benthic organisms, severe disruption to the littoral habitat.	Possible unforeseen adverse interactions with native species.
Minimum disruption of water quality.	Short term disruption of water quality.	No disruption of water quality or long term effects.	No long term disruption of water quality.	No disruption of water quality.	No disruption of water quality.	None
None.	Temporary localized turbidity following treatment. May release bound pollutants from the sediments.	Some temporary localized turbidity to small areas during treatment.	Temporary localized turbidity to small areas during treatment.	None.	Could result in water levels that are below water intakes. Shore erosion resulting from dewatering could cause water quality problems.	May decrease water quality by increasing algae during certain periods.
Does not disrupt use of irrigation water.	Short term disruption of water quality.	Does not disrupt use of irrigation water.	Does not disrupt use of irrigation water.	Does not disrupt use of irrigation water.	None.	Does not disrupt use of irrigation water.
None.	Temporary localized turbidity following treatment. May release bound pollutants from the sediments.	None.	None.	None.	May result in water levels that are below water intakes and less irrigation water supply.	None.
No possible chronic impacts.	No possible chronic impacts.	No possible chronic impacts.	No chronic impacts, small area affected.	No chronic impacts, small area affected.	No possible chronic impacts.	No possible chronic impact
May have some effect due to non-selective loss of aquatic vegetation. Some direct kill of small fish during harvesting.	Destruction of benthic communities may have adverse effects on other aquatic organisms that feed on the benthos. Non-selective loss of aquatic vegetation.	Very slight impact due to increased turbidity.	Slight impact due to increased turbidity.	Very slight impact due to non-selective loss of vegetation.	Non-selective loss of aquatic vegetation. Dewatering of the shore zone can kill benthic organisms, fish, and fish eggs.	Imported species may adversely affect existing fish populations.
No possible chronic impacts.	No possible chronic impacts.	No possible chronic impacts, small area affected.	No possible chronic impacts, small area affected.	No possible chronic impacts small area affected.	No possible chronic impacts.	No possible chronic impacts.
May have minor effects on wildlife due to non-selective loss of vegetation.	May have minor effects on wildlife due to non-selective loss of vegetation.	May have minor effects due to non-selective loss of vegetation.	None.	May have minor effects due to non-selective loss of vegetation.	Dewatering on the littoral zone could have adverse impacts on resident and migratory waterfowl and shore birds that feed and nest in shore zones.	None.
Very effective in removing weed stems to depth of 8 feet. Immediate relief-few changes to water column or bottom.	66% removal of roots in "random"-traverses. 95% removal of roots in circular patterns and 2 passes. Operates in deeper water than other mechanical methods. Local disturbance only.	90% effective in removing plants to any depth. Useful for small areas. Successful use in rocky areas and near obstacles.	Useful for confined areas, rocky areas and near obstacles.	Material is reusable, useful for small confined areas, rocky areas, and near obstacles. Impact localized to the area treated. 95% effective after 14 days of coverage.	100% effective on well drained slopes in the dewatered zone.	This method has not b sufficiently develop for practical appli
Regrowth to surface possible within 1 month. Causes spread of fragments. Stimulates regrowth of plant. Shore disposal of wet weeds.	Short term increases in turbidity. Cannot operate in rough weather. Shore disposal of wet weeds.	Regrowth possible in 1-2 years. Suitable for treatment of small areas only. Susceptible to storms and public interference. Slow and labor intensive.	Very limited in possible scope, labor intensive, very costly.	Subject to lifting by gas bubbles. Anchoring may be difficult.	Can only be used in water bodies where the level can be controlled.	
$920/acre includes two cuttings/year.	$600 to $700/acre ($50,000 capital cost).	$800 to $900/acre ($12,000 capital cost).	Is labor intensive and expensive. Actual costs dependent upon situation.	$10,870/acre installed.	Cost estimates have not been developed.	This method is still bei researched. No cost est are available.

TREATMENT METHODS

...ORS	MECHANICAL: SUCTION DREDGE	MECHANICAL: HAND REMOVAL	ENVIRONMENTAL MANIPULATION: BOTTOM SHADING	ENVIRONMENTAL MANIPULATION: WATER LEVEL FLUCTUATIONS	BIOLOGICAL: HERBIVOROUS FISH	BIOLOGICAL: INSECTS, PATHOGENS, ETC.
... is con- ... to non- ... dis- ...ate.	Very selective in treatment area and somewhat selectiv in plant removal.	Very selective for treatment area.	Very selective for treatment area.	None.	None.	None.
...ases ... ...oval of	Non-selective loss of vegetation in turbid waters.	None.	Disruption of benthic communities.	Dewatering of th shore zone would kill aquatic plants, benthic organisms, severe disruption to the littoral habitat.	Possible unforeseen adverse interactions with native species.	Possible unforeseen adverse interactions with native species.
...tion	No disruption of water quality or long term effects.	No long term disruption of water quality.	No disruption of water quality.	No disruption of water quality.	None.	No disruption of substrate or introduction of chemicals to the water.
...ed turbidity ...nt. ... the	Some temporary localized turbidity to small areas during treatment.	Temporary localized turbidity to small areas during treatment.	None.	Could result in water levels that are below water intakes. Shore erosion resulting from dewatering could cause water quality problems.	May decrease water quality by increasing algae during certain periods.	None.
...tion of	Does not disrupt use of irrigation water.	Does not disrupt use of irrigation water.	Does not disrupt use of irrigation water.	None.	Does not disrupt use of irrigation water.	Does not disrupt use of irrigation water.
...and ...ing treat- ...e bound ...the	None.	None.	None.	May result in water levels that are below water intakes and less irrigation water supply.	None.	None
...ic impacts.	No possible chronic impacts.	No chronic impacts, small area affected.	No chronic impacts, small area affected.	No possible chronic impacts.	No possible chronic impacts.	Potential food source for other aquatic organisms.
...enthic ... have ...on other ... that feed ... Non- ... aquatic	Very slight impact due to increased turbidity.	Slight impact due to increased turbidity.	Very slight impact due to non-selective loss of vegetation.	Non-selective loss of aquatic vegetation. Dewatering of the shore zone can kill benthic organisms, fish, and fish eggs.	Imported species may adversely affect existing fish populations.	May adversely affect existing fish food sources.
...ic	No possible chronic impacts, small area affected.	No possible chronic impacts, small area affected.	No possible chronic impacts small area affected.	No possible chronic impacts.	No possible chronic impacts.	
...ffects on ...on- ...	May have minor effects due to non-selective loss of vegetation.	None.	May have minor effects due to non-selective loss of vegetation.	Dewatering on the littoral zone could have adverse impacts on resident and migratory waterfowl and shore birds that feed and nest in shore zones.	None.	This method is still being studied. Potential impacts are being investigated.
...ts in "ran- ...95% removal ...lar patterns ...ates in ... other mech- ... Local	90% effective in removing plants to any depth. Useful for small areas. Successful use in rocky areas and near obstacles.	Useful for confined areas, rocky areas and near obstacles.	Material is reusable, useful for small confined areas, rocky areas, and near obstacles. Impact localized to the area treated. 95% effective after 14 days of coverage.	100% effective on well drained slopes in the dewatered zone.	This method has not been sufficiently developed for practical application.	This method has not been sufficiently developed for practical application.
...ses in ...ot operate ... Shore ... weeds.	Regrowth possible in 1-2 years. Suitable for treatment of small areas only. Susceptible to storms and public interference. Slow and labor intensive.	Very limited in possible scope, labor intensive, very costly.	Subject to lifting by gas bubbles. Anchoring may be difficult.	Can only be used in water bodies where the level can be controlled.		
... cost).	$800 to $900/acre ($12,000 capital cost).	Is labor intensive and expensive. Actual costs dependent upon situation.	$10,870/acre installed.	Cost estimates have not been developed.	This method is still being researched. No cost estimates are available.	This method is still being researched. No cost estimates have been developed.

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TABLE 2 A

CONSIDERATIONS		CHEMICAL				
		2, 4-D (DMA & BEE)	ENDOTHALL *	DIQUAT	DICHLOBENIL	HARVESTERS
PHYSICAL (BOTTOM COMPOSITION AND CONFIGURATION, OBSTACLES, DEPTH, WATER CURRENTS, ETC.)	Advantages	Can be used in localized areas. Not hindered by bottom type or underwater obstacles. No alteration of the bottom.	Can be used in localized areas. Not hindered by bottom type or underwater obstacles. No alteration of the bottom.	Can be used in localized areas. Not hindered by bottom type or underwater obstacles. No alteration of the bottom.	Can be used in localized areas. Not hindered by bottom type or underwater obstacles. No alteration of the bottom.	No alteration of the bottom.
	Disadvantages	Cannot be used in rapidly moving water.	Cannot be applied in rapidly moving water.	Cannot be applied in rapidly moving water.	Cannot be applied in rapidly moving water.	Cannot be used in confined areas or near obstacles. Rough water conditions must be avoided.
RECREATION (WATER CONTACT AND NONWATER CONTACT)	Advantages	There are no swimming, water skiing or fishing restrictions following treatment with 2,4-D.	None.	There are no restrictions on fishing after treatment.	There are no restrictions on swimming after treatment.	There are no restrictions on recreational use after physical removal of harvester.
	Disadvantages	None.	Fish from treated water cannot be used for food or feed for 3 days after application. Swimming should be restricted for 24 hours after treatment.	Swimming should be restricted for 10 days following application.	Fish from treated water can not be used for food or feed for 90 days following application.	Swimmers, boaters and water skiers would have to avoid harvesting equipment during harvesting operations.
NAVIGATION (COMMERCIAL)	Advantages	None.	None.	None.	None.	None.
	Disadvantages	None.	None.	None.	None.	Could interrupt or congest navigation routes during treatment operations.
HYDROPOWER	Advantages	None.	None.	None.	None.	Would remove aquatic vegetation from the water, decreasing floating mats which could clog water intakes.
	Disadvantages	None.	None.	None.	None.	None.
HUMAN TOXICITY		Fairly low toxicity. May have chronic effects with repeated exposure.	Acute and chronic toxicities unknown.	Acute and chronic toxicities unknown.	Acute and chronic toxicities unknown.	None.
REGULATORY REQUIREMENTS (PERMITS, VARIANCES, REGISTRATION, LICENCES, ETC.)		Commercial preparations must have an EPA approved label and a registration number. The applicator must be licensed and label restrictions must be followed. A water quality variance from the Department of Ecology is required.	Commercial preparations must have an EPA approved label and a registration number. The applicator must be licensed and label restrictions must be be followed. A water quality variance from the Department of Ecology is required.	Commercial preparations must have an EPA approved label and a registration number. The applicator must be licensed and label restrictions must be followed. A water quality variance from the Department of Ecology is required.	Commercial preparations must have an EPA approved label and a registration number. The applicator must be licensed and label restrictions must be followed. A water quality variance from the Department of Ecology is required.	None.
AVERAGE RATE		2,4-D (DMA) 100 acres/day 2,4-D (BEE) 80 acres/day	endothall liquid 100 acres/day endothall granular 16 acres/day	100 acres/day.	50 acres/day	Up to 10 acres per day. Average about 6 acres per day. (Aqua-Trio Unit) Less for smaller units.

* DIPOTASSIUM SALT

TABLE 2 ALTERNATE TREATMENT METHODS

MECHANICAL				ENVIRONMENTAL MANIPULATION		
HARVESTERS	ROTOVATORS	SUCTION DREDGE	HAND REMOVAL	BOTTOM SHADING	WATER LEVEL FLUCTUATION	HERBIVOROUS F[illegible]
No alteration of the bottom.	None.	Can be used on a rocky substrate and near obstacles.	Diver can go anywhere to remove small patches.	No permanent alterations of bottom. Can be used near obstacles and in any depth water. No disturbance to water column. Sediments are not disturbed.	Not affected by obstruction.	Not affected by obstruc[illegible]
Cannot be used in confined areas or near obstacles. Rough water conditions must be avoided.	Cannot operate in confined areas or near obstacles. Rough water conditions must be avoided.	None.	Raking or hand pulling can be used only in shallow shore zones.	Subject to storm and wave damage.	Drawdown can cause shore erosion.	None.
There are no restrictions on recreational use after physical removal of harvester.	No long-term recreational restrictions.	No restriction to recreational use.	No restriction to recreational use.	No restriction to recreational use.	None.	No restriction to recreational use.
Swimmers, boaters and water skiers would have to avoid harvesting equipment during harvesting operations.	Swimmers, boaters, and water skiers would have to avoid rotovating equipment during treatment and operations. Water turbidity would discourage recreational use.	Swimmers, boaters, and water skiers would have to avoid dredging equipment during treatment operations.	Swimmers, boaters and water skiers would have to avoid areas during operation.	Could limit swimming and boating activities during the treatment period	Drawdown operations during spring and summer could restrict use of recreational facilities.	None.
None.	None.	None.	None.	None.	None.	None.
Could interrupt or congest navigation routes during treatment operations.	Could interrupt or congest navigation routes during treatment operations.	Could interrupt or congest navigation routes during treatment operations.	None.	None.	Drawdown operations could adversely affect the depth of navigation channels.	None.
Would remove aquatic vegetation from the water, decreasing floating mats which could clog water intakes.	Would remove aquatic vegetation from the water, decreasing floating mats which could clog water intakes.	None.	None.	None.	None.	None.
None.	None.	None.	None.	None.	Drawdown operations could be limited by the location of multi-level intakes. Could affect hydropower capacity.	None.
None.	None.	None.	None.	None.	None.	None.
None.	May require Department of the Army and State of Washington shoreline permits due to the alteration of the bottom.	None.	None.	Would require Department of the Army and State shoreline permits for installation in navigable waters.	Permits could be required for drawdown operations.	Washington State law [illegible] hibits the importation [illegible] exotic species. Fed[illegible] law requires U.S. Dep[illegible] of Agriculture review [illegible] testing of exotic [illegible]
Up to 10 acres per day. Average about 6 acres per day. (Aqua-Trio Unit) Less for smaller units.	0.5 acre/day average depending on number of passes.	0.9 acre/day (average) depends on weed density.	Minimal.	1 acre/day.	Variable.	Unknown.

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ATE TREATMENT METHODS

MECHANICAL			ENVIRONMENTAL MANIPULATION		BIOLOGICAL	
VATORS	SUCTION DREDGE	HAND REMOVAL	BOTTOM SHADING	WATER LEVEL FLUCTUATION	HERBIVOROUS FISH	INSECTS, PATHOGENS, ETC.
	Can be used on a rocky substrate and near obstacles.	Diver can go anywhere to remove small patches	No permanent alterations of bottom. Can be used near obstacles and in any depth water. No disturbance to water column. Sediments are not disturbed.	Not affected by obstruction.	Not affected by obstruction.	Not affected by obstruction.
ate in confined r obstacles. conditions ded.	None.	Raking or hand pulling can be used only in shallow shore zones.	Subject to storm and wave damage.	Drawdown can cause shore erosion.	None.	None.
recreational .	No restriction to recreational use.	No restriction to recreational use.	No restriction to recreational use.	None.	No restriction to recreational use.	
boaters, and water d have to avoid equipment during operations. dity would dis- reational use.	Swimmers, boaters, and water skiers would have to avoid dredging equipment during treatment operations.	Swimmers, boaters and water skiers would have to avoid areas during operation.	Could limit swimming and boating activities during the treatment period	Drawdown operations during spring and summer could restrict use of recreational facilities.	None.	This method is still being studied. Potential impacts are being investigated.
	None.	None.	None.	None.	None.	None.
rupt or congest routes during operations.	Could interrupt or congest navigation routes during treatment operations.	None.	None.	Drawdown operations could adversely affect the depth of navigation channels.	None.	None.
aquatic from the water. floating mats clog water	None.	None.	None.	None.	None.	None.
	None.	None.	None.	Drawdown operations could be limited by the location of multi-level intakes. Could affect hydropower capacity.	None.	None.
	None.	None.	None.	None.	None.	None.
Department of State of horeline to the altera- bottom.	None.	None.	Would require Department of the Army and State shoreline permits for installation in navigable waters.	Permits could be required for drawdown operations.	Washington State law prohibits the importation of exotic species. Federal law requires U.S. Department of Agriculture review and testing of exotic species.	Washington State law prohibits the importation of exotic species. Federal law requires U.S. Department of Agriculture review and testing of exotic species.
average number of	0.9 acre/day (average) depends on weed density.	Minimal.	1 acre/day.	Variable.	Unknown.	Unknown.

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A definite cost per acre for suction dredge has not been established. Based upon the Canadian program, costs in the range of $800 to $900 per acre, plus capital cost ($12,000), could be expected.

1.04.4 Hand Removal. Hand removal can consist of either pulling individual plants by hand, which removes the roots, or by using a rake or other tool which would remove only the foliage. This method is obviously limited but can be used to clear around private piers or to remove small patches to prevent spread. In deeper water, divers and special equipment would be required.

The cost of this method, which would be based principally on labor and the cost of diving equipment, if required, would be entirely dependent on the situation. The use of this method would be minimal and very localized. No per-acre cost has been estimated because of lack of data and limited probable use of this method.

1.04.5 Chemical Treatment.

1.04.5.1 2,4-D. The chemical 2,4-dichlorophenoxyacetic acid (2,4-D) is a systemic herbicide registered by the U.S. Environmental Protection Agency (EPA) and the Washington State Department of Agriculture (WDA) for aquatic plant control. 2,4-D kills the milfoil roots as well as the upper plant portion. One treatment per year should provide adequate control. 2,4-D has a high degree of selectivity for milfoil and does not affect most native species at recommended treatment concentrations. It is suitable for use in most Washington State waters currently infested with milfoil. It would be especially useful in areas that are too large for hand removal or suction dredge and where complete control is required. 2,4-D would have use restrictions in the vicinity of domestic or irrigation water intakes and salmon spawning and rearing areas. Two different formulations of 2,4-D could be used for milfoil control: a liquid, dimethylamine salt (DMA); and a granular form, butoxyethanol ester (BEE).

The recommended application rate for liquid 2,4-D (DMA) is 5 gallons per acre (20 pounds acid equivalent) in areas where the water depth is 4 feet or less, and 10 gallons per acre (40 pounds acid equivalent) where the water is deeper than 4 feet. The per-acre costs for areas greater than 4 feet deep is approximately $770. The recommended application rate for the granular form of 2,4-D (BEE) is 100 pounds per acre (20 pounds acid equivalent). The per-acre cost is approximately $760.

1.04.5.2 Endothall (Dipotassium Salt), Dichlobenil, and Diquat. Diquat and the dipotassium salt formulation of endothall, hereafter referred to as endothall, are contact herbicides registered by EPA and the State Department of Agriculture for aquatic plant control; they kill the leaves and stems but do not affect aquatic plant roots. Dichlobenil is systemic and thus would cause some root kill. These chemicals are not selective to milfoil; they would also kill many native species of aquatic plants. For this reason, they are recommended for very limited use, primarily for areas in which the exclusion of all aquatic growth is acceptable (e.g., swimming beaches).

These chemicals could kill many terrestrial species, so care must be taken to insure that irrigation water is not treated. There are also some restrictions on swimming, fishing, and drinking the treated water for a period of time after the treatment. One treatment per year should give adequate control.

The recommended application rate for diquat is 2 gallons per acre (4 pounds active ingredient) at a per-acre cost of approximately $790. The recommended application rate for liquid endothall is 10 gallons per acre (30 pounds acid equivalent) at a per-acre cost of approximately $960. The recommended application rate for the granular form of endothall is 500 pounds per acre (10 percent active ingredient) at a per-acre cost of approximately $1,470. The recommended application rate for dichlobenil is 150 pounds per acre (10 percent active ingredient) at a per-acre cost of approximately $1,265.

1.04.6 Fiberglass Bottom Screens. Bottom screens involve the installation and anchoring of a polyvinyl chloride-coated fiberglass screen. The screen limits sunlight penetration and effectively eliminates all aquatic growth in the affected area.

Bottom screens have been tested as part of METRO's Union Bay Milfoil Demonstration Project and at some City of Seattle public swimming beaches and has shown to provide good milfoil control.

Because of the cost of the screen and the fact that it eliminates all vegetative growth, it is justified only for high-use areas where the exclusion of all aquatic growth is acceptable (e.g., swimming beaches).

The cost of fiberglass bottom screen is based on purchase and installation. The per-acre cost is $10,870 for the first year. Per-acre costs for subsequent years would be based on necessary maintenance for the life of the screen.

1.04.7 Integrated Control. Integrated control, the use of two or more control techniques in conjunction, has been shown to be effective in some situations. For instance, 2,4-D is most effective when applied to milfoil which is rapidly growing. Mechanical harvesting causes a spurt of growth, so chemical treatment immediately following harvest would be very effective. Because integrated control is expensive, it would only be practical if it could reduce the number of treatments necessary for a given time period.

1.04.8 Fragment Barriers. Barriers would be used to stop the downstream spread of floating milfoil fragments in flowing water systems which feed directly into uninfested waters. Barriers consist of a floating boom with fine mesh net extending 3 to 4 feet below the water surface. Barriers are believed to be 80 to 90 percent effective in stopping milfoil fragments; therefore, areas downstream of the barriers would have to be monitored for new colonies.

1.05 Proposed Prevention Program. The objective of the proposed prevention program is to restrain the spread of milfoil from infested water bodies to uninfested navigable waters. Eradication of new pioneer colonies would be attempted before they become firmly established. This would involve spot treatment of small areas. Hand removal of scattered plants or small colonies will be utilized where appropriate. Suction dredging is being successfully used in Canada and would be utilized where appropriate. Rotovating the bottom sediment to dislodge roots would also be appropriate on a limited basis. Use of 2,4-D is an acceptable treatment method because it is selective for milfoil and would kill the root systems. Fragment barriers would be used where applicable to slow downstream spread of plant fragments.

In addition, the proposed prevention program would employ a public information program and aerial and ground surveillance to identify new colonies.

Aerial photographs would be taken of areas having a high possibility of becoming infested or having a large potential adverse impact from milfoil infestation. Ground surveillance would be provided by Federal, state, or local resource management personnel normally in the field. They would be trained in milfoil identification and would notify the state coordinator or the Corps of Engineers of any milfoil growth they discover during the course of their normal work. Special teams would be sent out to survey areas identified by the aerial surveillance. The object of the surveillance would be to identify new colonies of milfoil so they would be treated before they became major problems.

Milfoil can be spread from lake to lake by recreational boating activity. The public information program would alert the boating public to this problem and encourage them to remove all aquatic plant fragments from their boats and trailers before leaving posted boat ramps.

The following areas are included in the proposed prevention program:

1.05.1 Osoyoos Lake. Osoyoos Lake lies north of the city of Oroville in Okanogan County. It is 10 miles long with a total surface area of 5,729 acres, of which 3,693 acres lie in British Columbia and 2,036 acres lie in the United States. It is drained by the Okanogan River, which flows southward to its confluence with the Columbia River near Brewster (see figure 3). The northern portion of Osoyoos Lake has dense colonies of milfoil, which are a constant source of fragments for the southern (United States) portion. The southern portion of Osoyoos Lake has a few small "pioneer" colonies and scattered milfoil plants and is a source of fragments for the Okanogan River. The proposal for Osoyoos Lake is to immediately treat all patches of milfoil, within the United States portion identified by aerial and ground surveillance.

'.05.2 Okanogan River. The Okanogan River drains Osoyoos Lake and is therefore subject to fragmented milfoil floating downstream (see figure 3). Small colonies of milfoil have been reported in the upper Okanogan River channel below Osoyoos Lake. The proposal for the Okanogan River is to eliminate fragment sources by immediately treating all existing milfoil colonies identified by aerial and ground surveillance, and to operate and maintain the established barrier structure.

1.05.3 Columbia River. Wells, Rocky Reach, Rock Island, Wanapum, and Priest Rapids are Columbia River reservoirs which lie downstream from the mouth of the Okanogan River (figure 3A). These reservoirs are subject to colonization by milfoil fragments from the Okanogan River and the Columbia Basin Irrigation Project which has several existing colonies of milfoil. All except Rock Island Reservoir are included in the first year surveillance program. Rock Island was not included because there has been no potentially infestable area identified in this reservoir. Spot treatment would be conducted if the surveillance program identified pioneer colonies of milfoil.

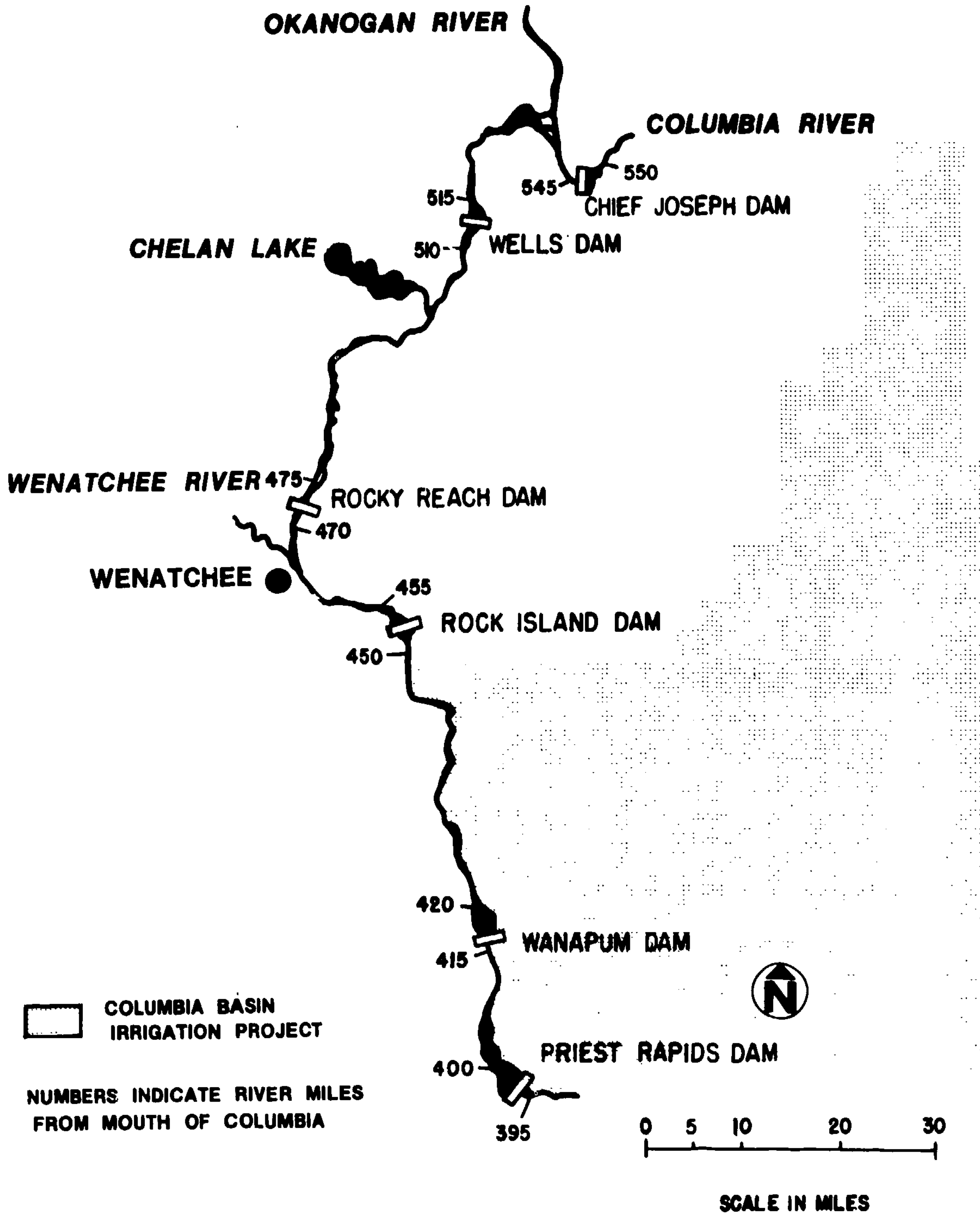
1.05.4 Other Water Bodies. In addition to the specific water bodies and reservoirs, other sites may be identified through public input or agency surveillance and included in the 1980 prevention program.

1.06 Proposed Control Program. The proposed control program involves treating high-use public areas obstructed by milfoil in Lake Washington, Lake Union, and Lake Sammamish (see figures 4 and 4A). A total of about 100 acres is proposed for treatment. Efforts to eradicate firmly established populations of milfoil in large water bodies have not been successful in other parts of the country and would not be attempted under the proposed control program. The control program is for maintenance of high-use areas. The specific areas and acceptable treatment methods are described in the following paragraphs. For each proposed treatment area, a figure is provided indicating the location, salmon migration routes, marshes, and locations of salmon spawning areas. Prior to treatment in each site-specific area, coordination with the fisheries agencies would be accomplished to insure that the work does not occur during peak migration and spawning periods.

Criteria established for selection of treatment areas is presented in paragraph 1.07.3.

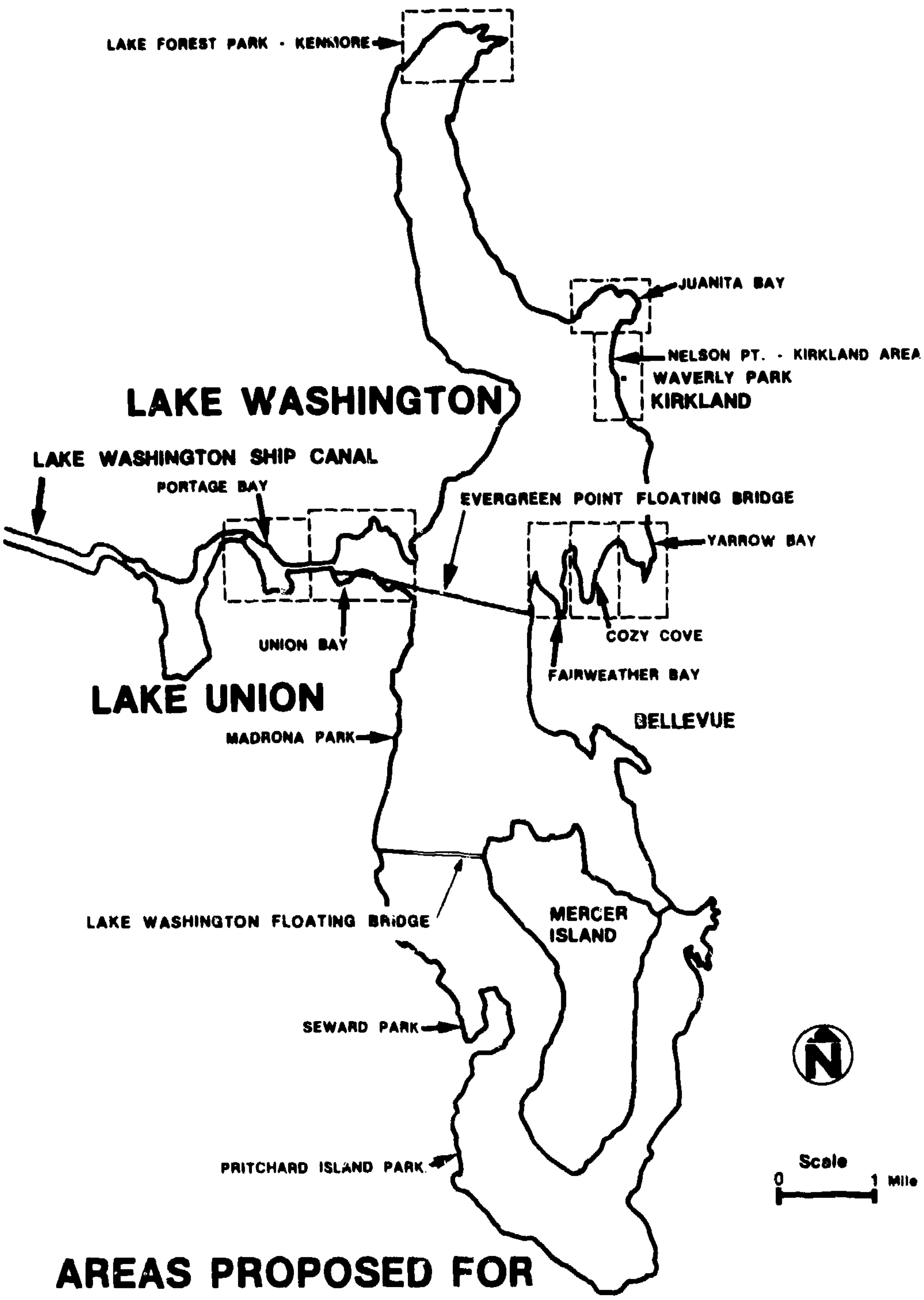
1.06.1 Lake Washington. Lake Washington lies to the east of Seattle. It is 19.5 miles long, with a total surface area of 22,138 acres, a maximum depth of 209 feet, and an average depth of 100 feet.

1.06.1.1 Union Bay. Total surface area of Union Bay is approximately 350 acres. The total area infested with milfoil is estimated at 200 acres. Union Bay is a high-use area both for recreational boating and water-skiing and for commercial navigation, with the Lake Washington Ship Canal traversing the southern portion of the bay in an east-west direction. Within Union Bay, the proposal is to treat a



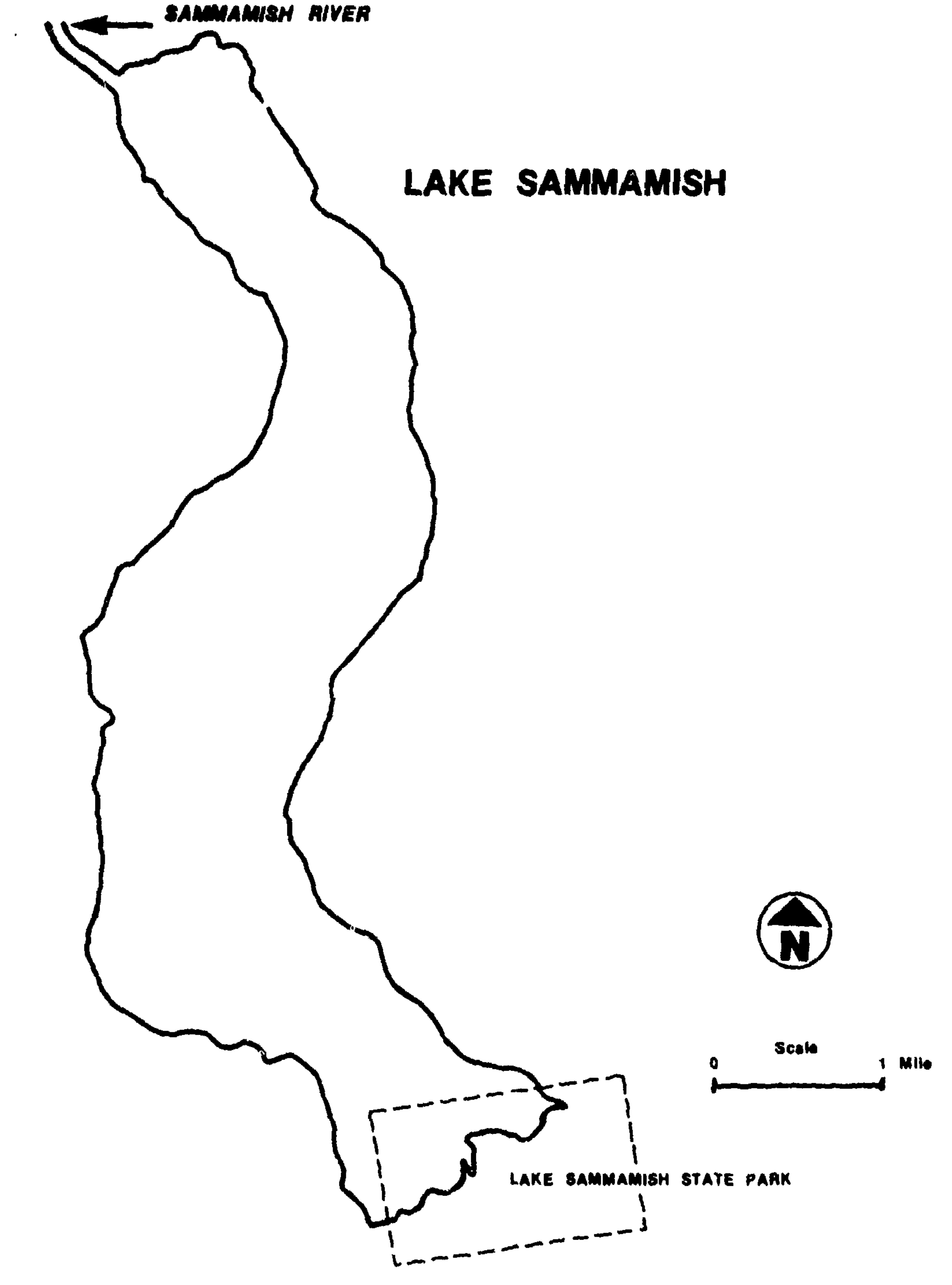
COLUMBIA RIVER RESERVOIRS

FIGURE 3A



AREAS PROPOSED FOR TREATMENT IN THE LAKE WASHINGTON/ LAKE UNION SYSTEM, 1980

FIGURE 4



AREA PROPOSED FOR TREATMENT, LAKE SAMMAMISH, 1980

FIGURE 4A

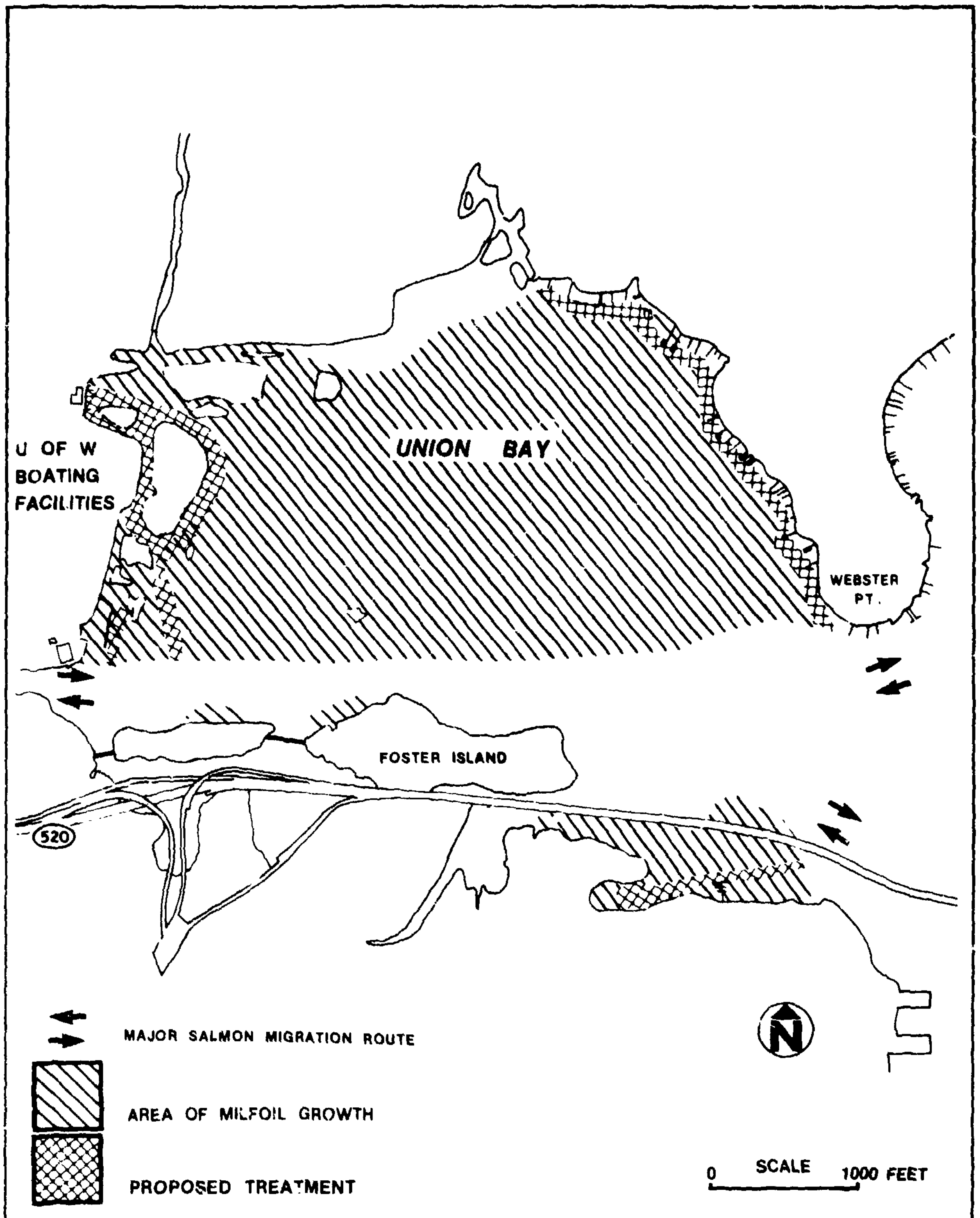
100-foot-wide channel in the high-use area along the shoreline of Webster Point, a distance of about 1,000 yards. The selection of a 100-foot-wide channel width is based on the objective of providing adequate navigation access while minimizing environmental impacts. In addition, 100-foot-wide channels in front of the University of Washington Yacht Club basin and boathouse and a 100-foot-wide channel on the south Union Bay shoreline are proposed for treatment. The total treatment area is about 17 acres (see figure 5). Acceptable treatment for Union Bay includes the use of mechanical harvesting and/or the application of 2,4-D.

1.06.1.2 Lake Forest Park-Kenmore. This area, located at the north end of Lake Washington, is a high-use area for recreational boating, seaplane use, and commercial navigation and is being obstructed by milfoil growth. The proposed treatment involves a 100-foot-wide channel along the shoreline west of the King County Log Boom Park and south to about the Lake Forest Park Community Beach as shown in figure 6. This is a distance of about 800 yards. Additional treatment would be performed as required along the county park frontage to maintain full public use. The total treatment area is about 9 acres. Acceptable treatment for this area includes the use of mechanical harvesting and/or the application of 2,4-D. The treatment for the county park may also include the use of fiberglass bottom screens or the chemicals endothall, diquat, or dichlobenil.

1.06.1.3 Juanita Bay. Located on the east side of Lake Washington just north of Kirkland, this bay has a surface area of approximately 185 acres. About 50 acres are heavily infested with milfoil. This area receives relatively heavy usage by private boaters and the public during the summer months. The proposal is to treat a 100-foot-wide channel along the shoreline in the high-use area (about 500 yards), as shown in figure 7, and treatment as necessary along the Juanita Beach County Park frontage to maintain full public use. The total treatment area is about 7 acres. Acceptable treatment for Juanita Bay includes the use of mechanical harvesting and/or the application of 2,4-D. The treatment for the county park may also include the use of fiberglass bottom screens or the chemicals endothall diquat, or dichlobenil.

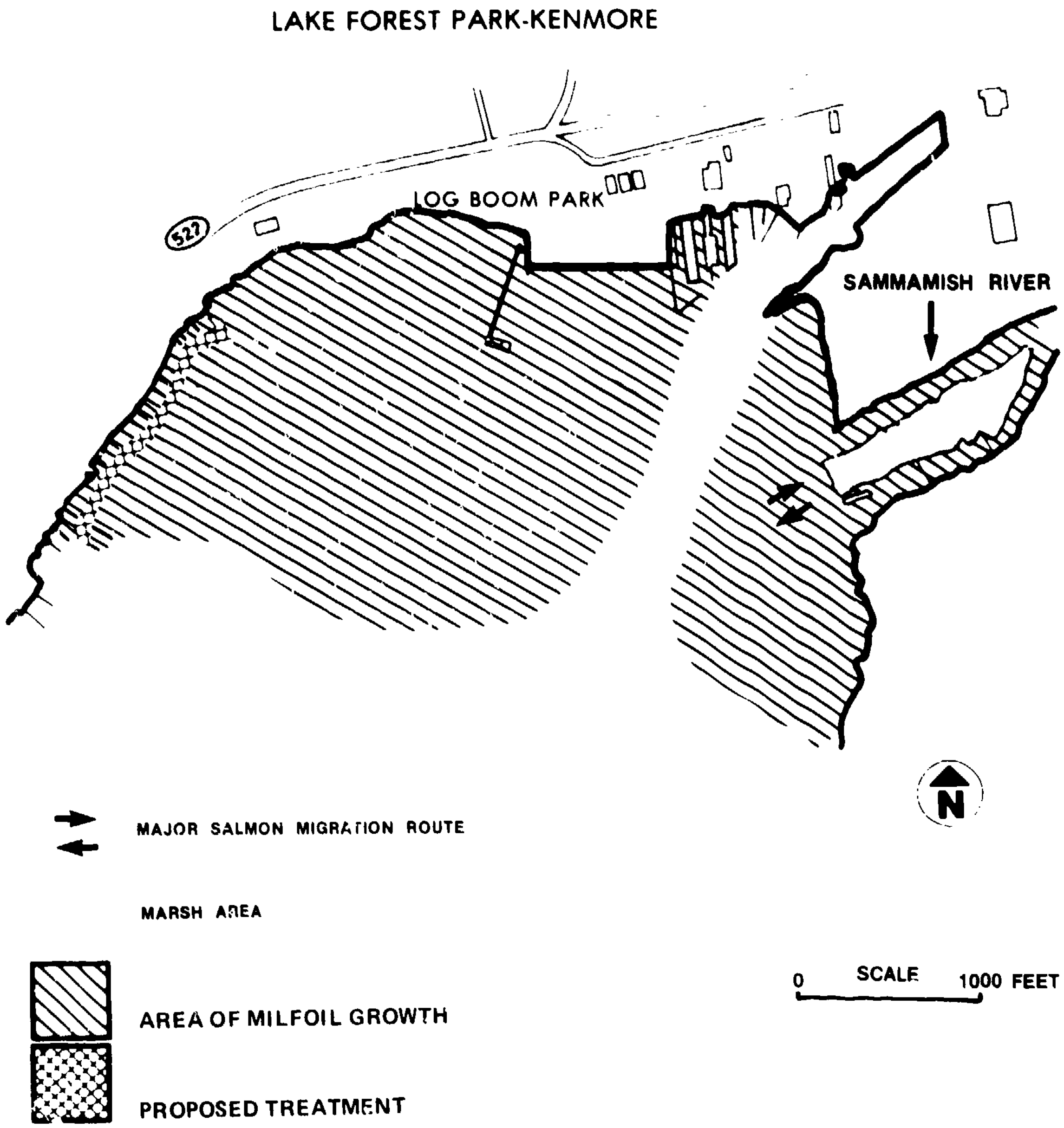
1.06.1.4 Nelson Point-Kirkland. This area, immediately south of Juanita Bay, is a relatively high-use area for boaters and water-skiers and is being obstructed by milfoil growth. The proposal is to treat a 100-foot-wide channel along 1,700 yards of shoreline and treatment as necessary to maintain full public use of Waverly Park. This would involve about 12 acres (see figure 8). Acceptable treatment includes the use of mechanical harvesting and/or the application of 2,4-D. In addition, the park could make use of fiberglass bottom screens or the chemicals endothall, diquat, or dichlobenil.

1.06.1.5 Yarrow Bay. Located on the east side of Lake Washington, Yarrow Bay has a surface area of approximately 118 acres, of which about 25 acres are heavily infested. It receives heavy recreational



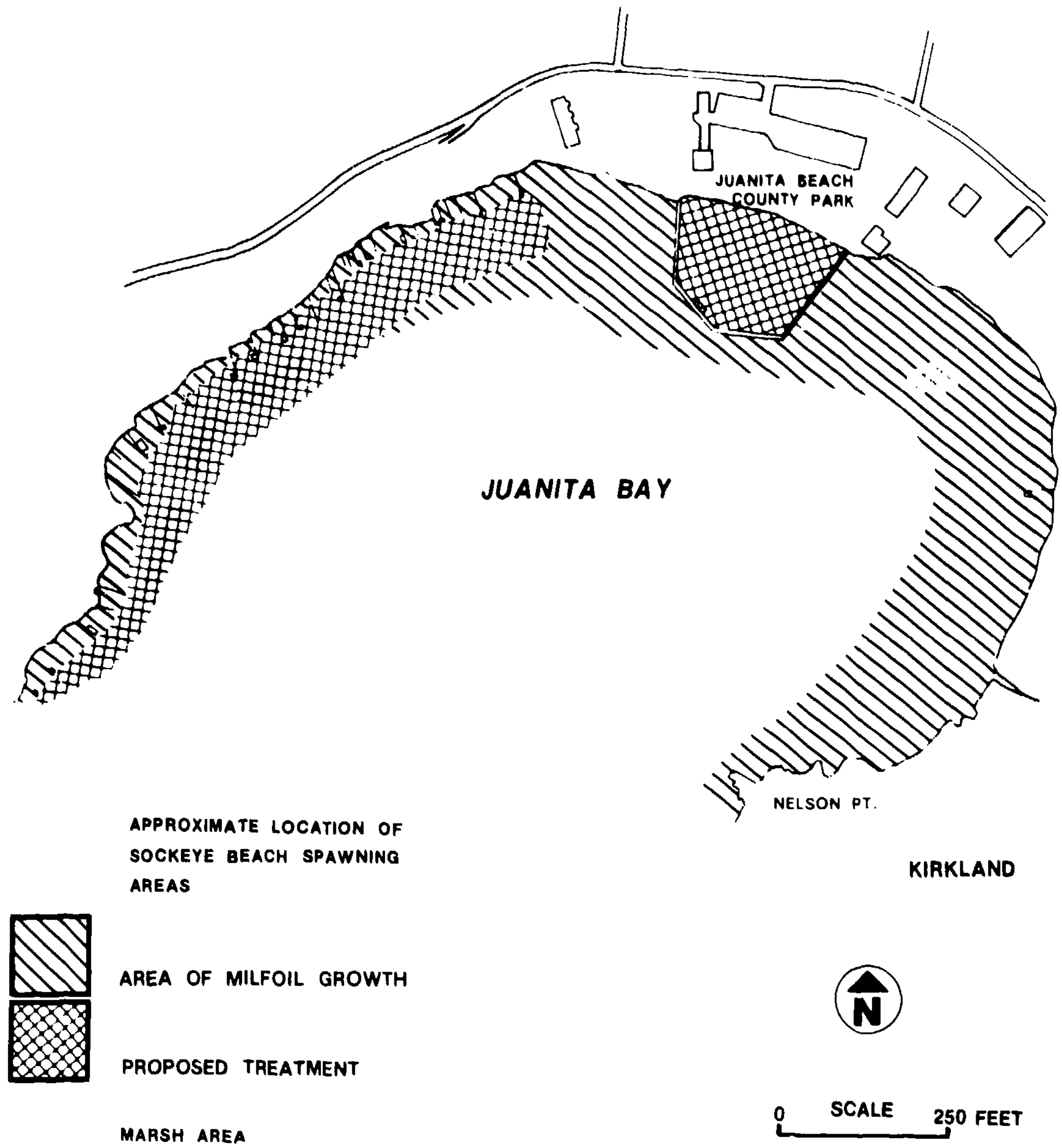
UNION BAY

FIGURE 5



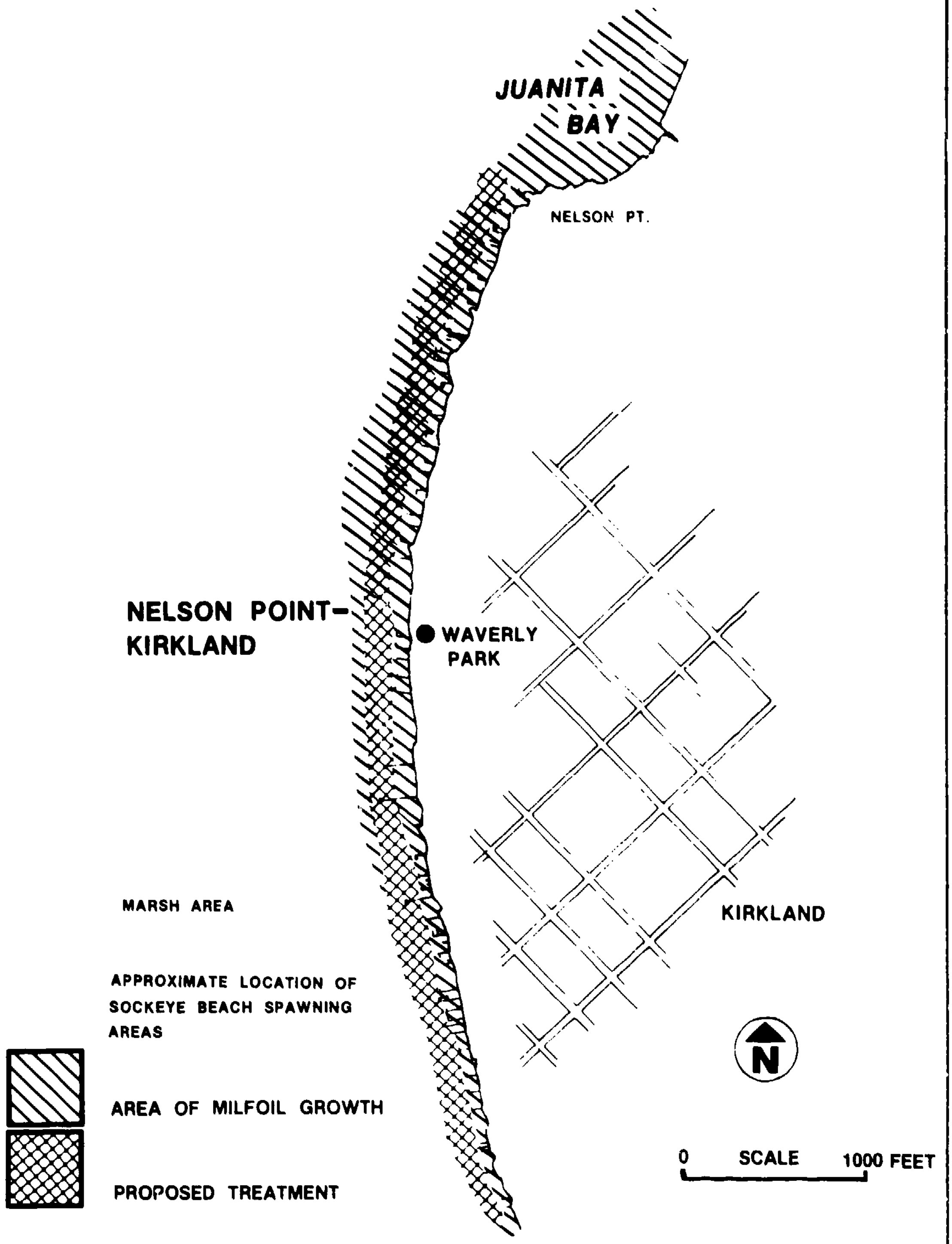
LAKE FOREST PARK-KENMORE

FIGURE 6



JUANITA BAY

FIGURE 7



NELSON POINT-KIRKLAND

FIGURE 8

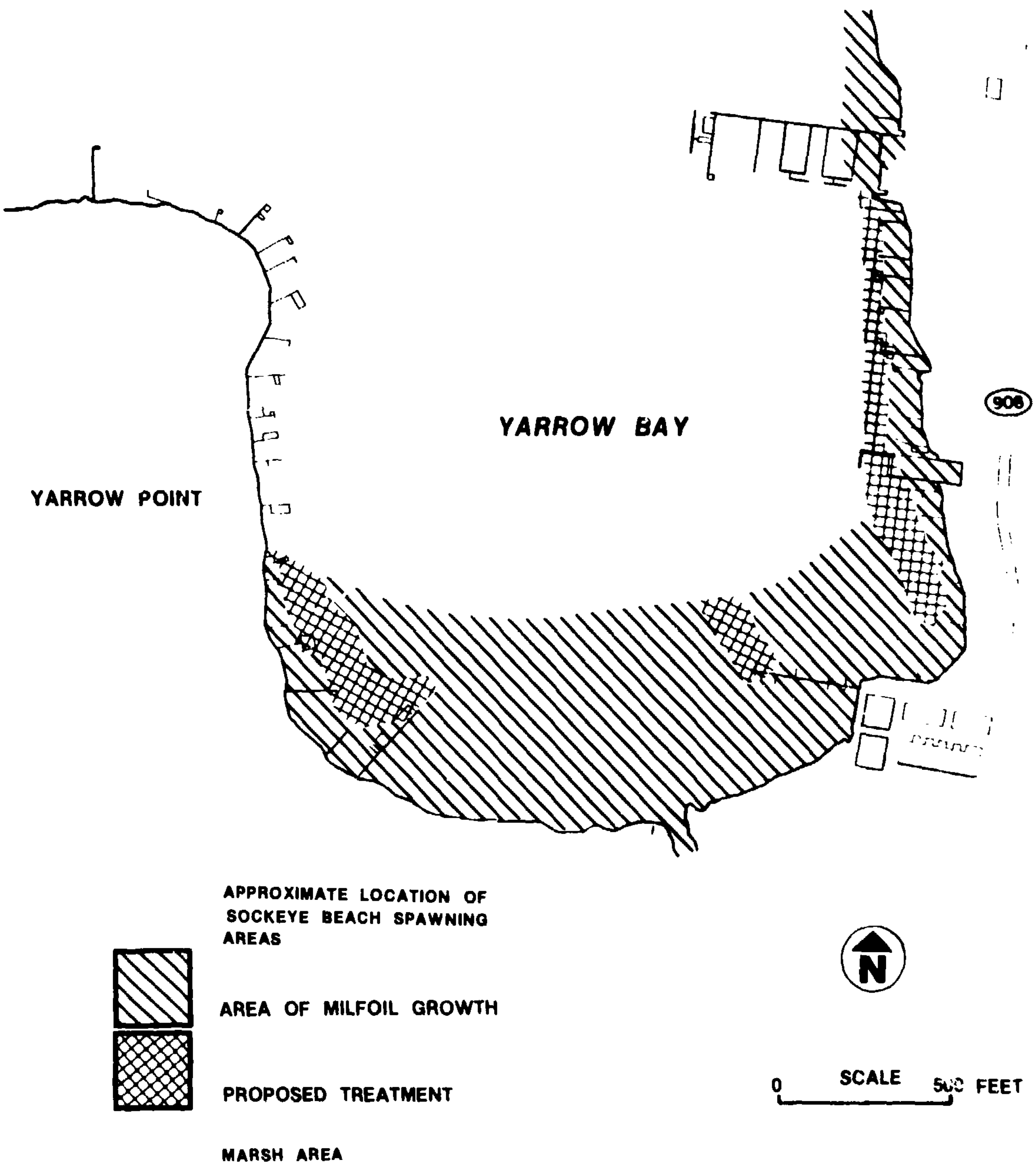
usage from boaters, swimmers, and water-skiers. Within Yarrow Bay, the proposal is to treat a 100-foot-wide channel along the shoreline in the high-use areas as shown in figure 9. This includes about 900 yards of shoreline for a total area of about 6 acres. Acceptable treatment includes the use of mechanical harvesting and/or the application of 2,4-D.

1.06.1.6 Cozy Cove. Located just west of Yarrow Bay, Cozy Cove has a surface area of 205 acres, of which approximately 40 are infested with milfoil. Cozy Cove is also a high-use area with boating, swimming, and water-skiing as the major recreational uses. The proposal is to treat a 100-foot-wide channel along the shoreline in the high-use areas as shown on figure 10. This includes about 1,400 yards of shoreline for a total area of about 10 acres. Acceptable treatment includes the use of mechanical harvesting and/or the application of 2,4-D.

1.06.1.7 Fairweather Bay. Fairweather Bay, located just west of Cozy Cove, has a surface area of about 87 acres. Approximately 40 acres are infested with milfoil. Fairweather Bay is a high-use recreational area for boaters, swimmers, and water-skiers. The proposal is to treat a 100-foot-wide channel along two sections of the shoreline for a total distance of about 2,500 yards. The area involved is about 17 acres (see figure 11). Acceptable treatment includes the use of mechanical harvesting and/or the application of 2,4-D.

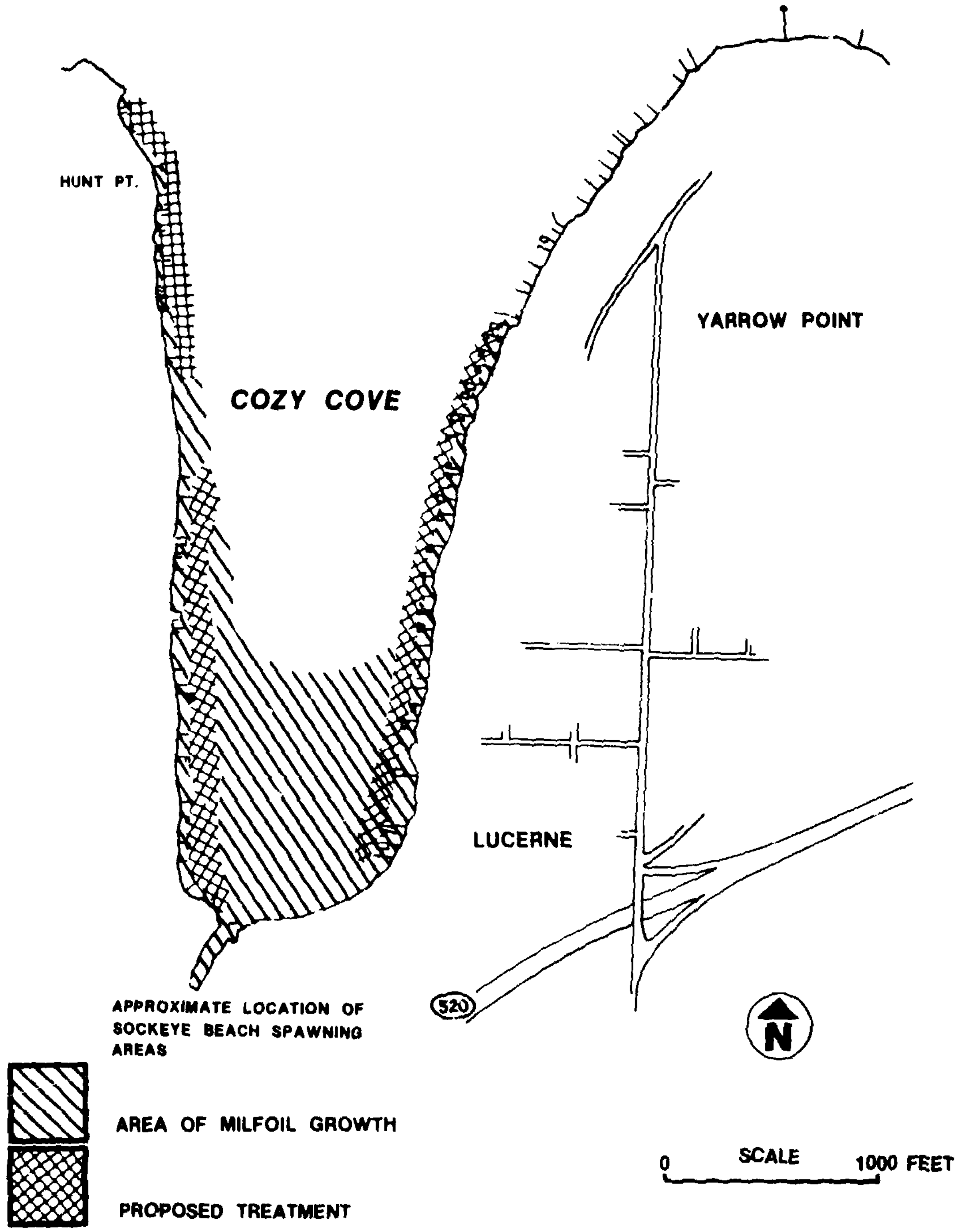
1.06.1.8 Seward, Madrona, and Pritchard Island Parks. These three Seattle city parks are located on the west side of Lake Washington (see figure 4 for location). The swimming beaches are primarily affected, and treatment would be limited to those areas of particularly heavy growth. Treatment of these beach areas would be done as necessary to maintain full public use. The acreage to be treated is roughly estimated at 2 acres. The acceptable treatment methods include the use of mechanical harvesting, fiberglass bottom screens, or the application of 2,4-D, endothall, diquat, or dichlobenil.

1.06.2 Lake Union. Lake Union lies just west of Lake Washington and the two are connected by the Portage Cut. Lake Union has a total surface area of 646 acres, including Portage Bay, and a maximum depth of 54 feet. Portage Bay is the only area currently proposed for treatment in Lake Union. This is an area with very heavy usage from pleasure boats and commercial traffic. Of approximately 148 acres of surface area, about 45 acres are infested with milfoil. The proposal is to treat those portions of the existing infestation which particularly interfere with recreation boat use, including access to the navigation channel. The treated area would total about 14 acres (see figure 12). Acceptable treatment methods include the use of mechanical harvesting and/or the application of 2,4-D.



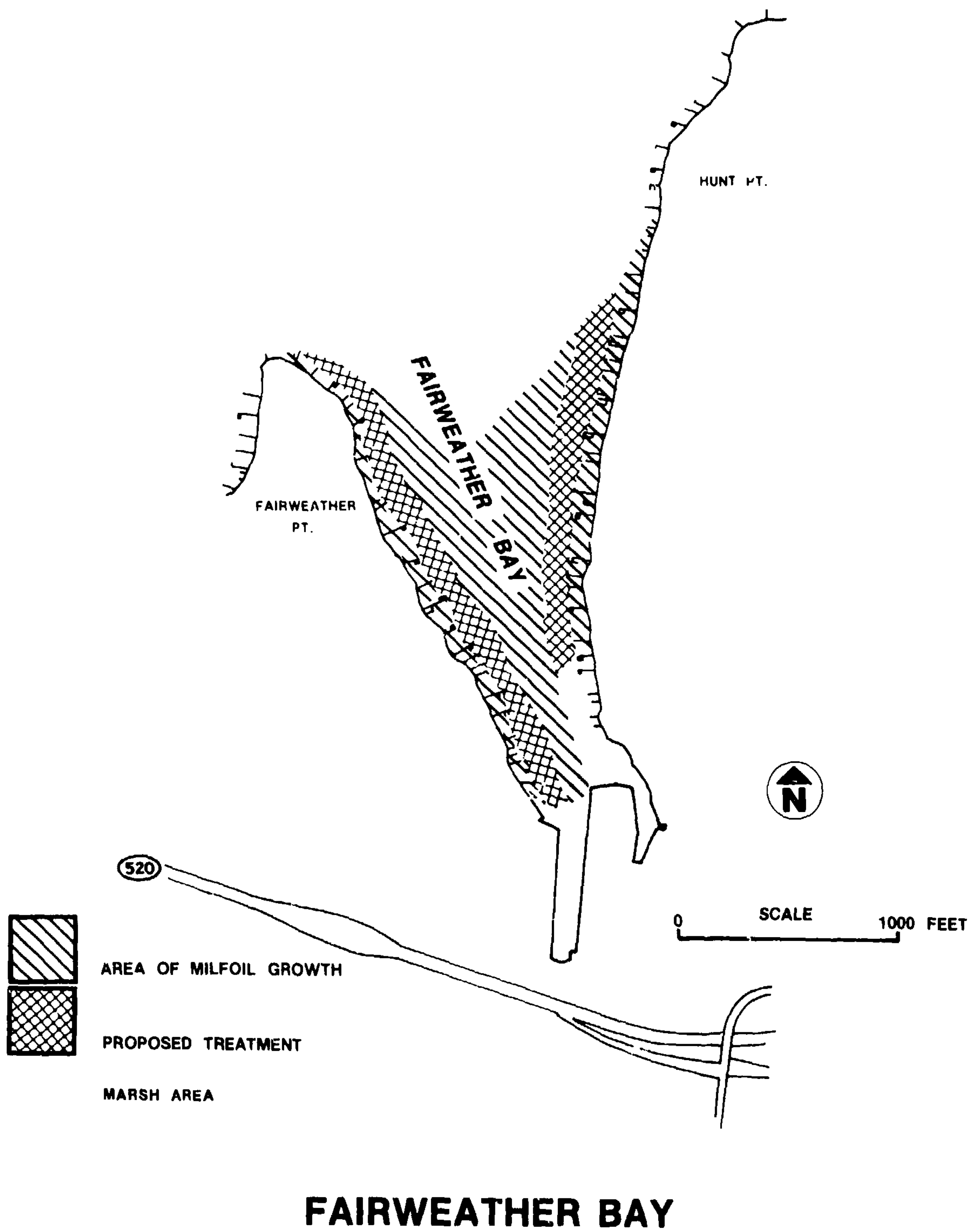
YARROW BAY

FIGURE 9



COZY COVE

FIGURE 10



FAIRWEATHER BAY

FIGURE 11

1.06.3 Lake Sammamish. Lake Sammamish lies east of Lake Washington and discharges into it via the Sammamish River. The lake is 8 miles long with a total surface area of 4,897 acres and a maximum depth of 100 feet. The water fronting Lake Sammamish State Park is the only area on Lake Sammamish currently proposed for treatment. The state park beach is very heavily used, as is the public boat launch area. The proposal is to treat these public recreation areas as necessary to maintain full public use. This would include about 500 linear feet along the beachfront and an indeterminate distance in the boat launch areas (see figure 12A). The area involved is estimated to be approximately 2 acres. Acceptable treatment methods include the use of mechanical harvesting, fiberglass bottom screens, or the application of 2,4-D, endothall, diquat or dichlobenil.

1.07 Proposed Monitoring and Evaluation Program.

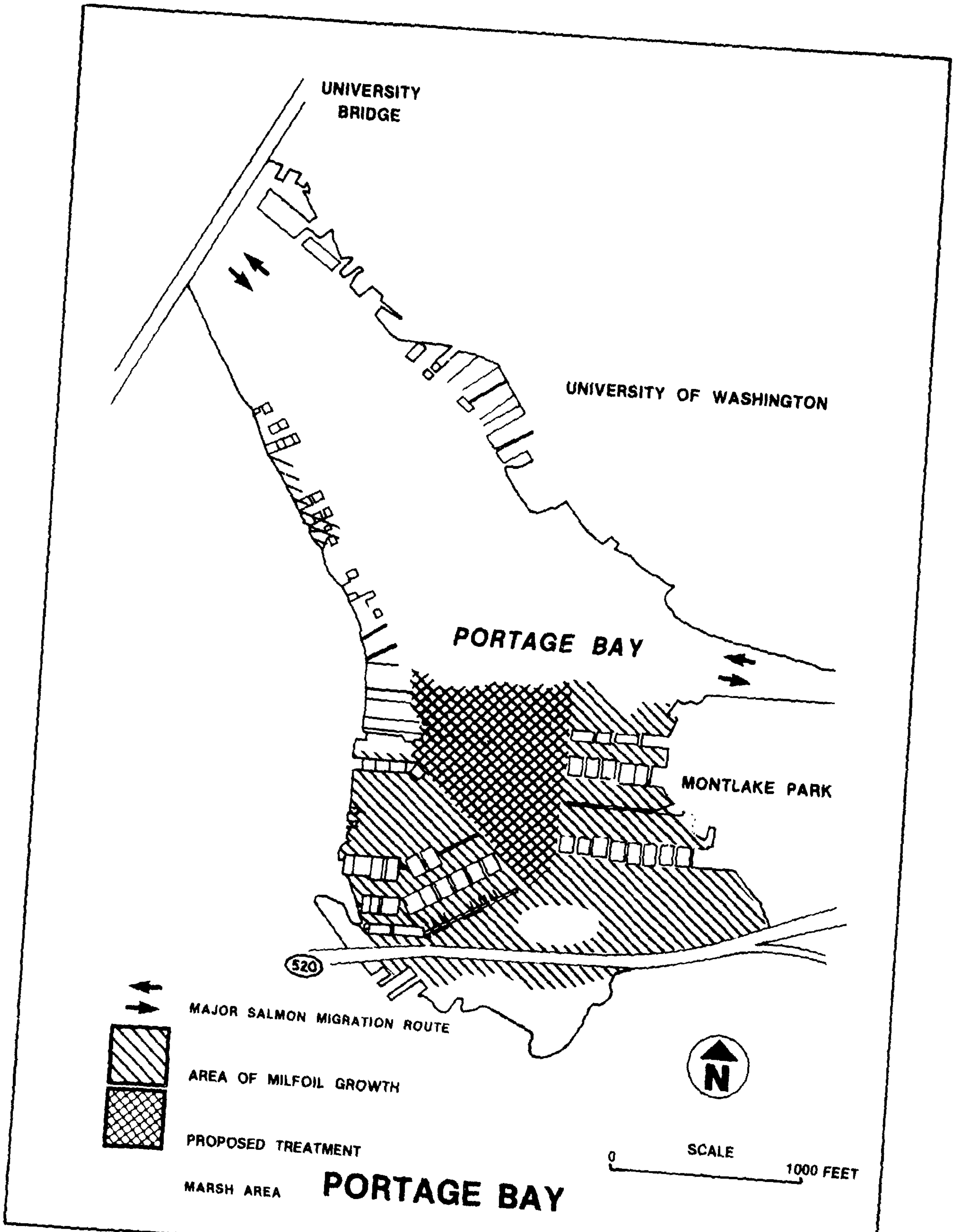
1.07.1 General. Monitoring of any chemical treatment application is included in the program to insure that the potential for public health risks and impacts to aquatic systems is kept to a minimum. Evaluation is included to assess the overall results of the Aquatic Plant Management Program and the effectiveness of the various alternatives for controlling existing populations of milfoil and preventing its spread to uninfested navigable waters. Monitoring and evaluation efforts have been developed such that responsibilities are shared by the Corps of Engineers and the State of Washington.

1.07.2 Corps of Engineers. The Corps will annually evaluate the state-of-the-art of prevention and control measures. This evaluation will include a review of literature, including WES research, and coordination with other Corps of Engineers districts and other agencies. The Corps, in coordination with WDE, will also evaluate the performance of the program.

1.07.3 State of Washington.

WDE will be responsible for evaluating the treatment site selections to ensure that the following criteria are met:

- The treatment is proposed by a qualified local sponsor.
- Prevention measures are given a higher priority than control measures.
- Sites are not located within authorized Federal projects.
- The site selected is in a navigable water of the United States and is infested with milfoil to a degree which impairs recreational usage, navigation, flood control, drainage, agriculture, fish and wildlife, public health, hydropower, or related purposes, or in any water body which may result in the infestation of navigable waters.


UNIVERSITY
BRIDGE
UNIVERSITY OF WASHINGTON
PORTAGE BAY
MONTLAKE PARK
520
MAJOR SALMON MIGRATION ROUTE
AREA OF MILFOIL GROWTH
PROPOSED TREATMENT
MARSH AREA
N
SCALE
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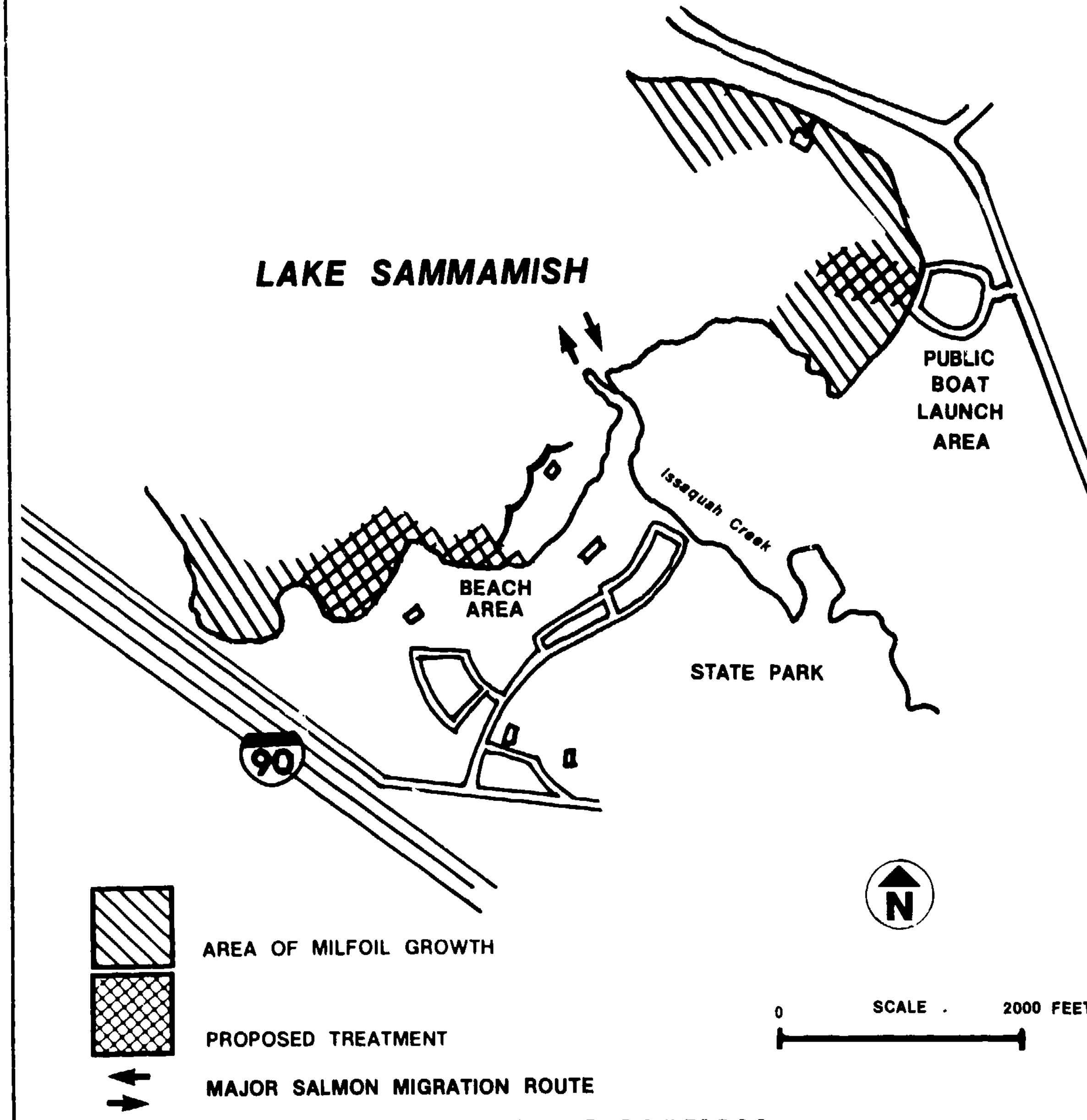
1000 FEET
PORTAGE BAY

FIGURE 12



LAKE SAMMAMISH

FIGURE 12 A

• Treatment of the proposed site will not result in an unacceptable impact to the environment.

• The treatment methods selected by the local sponsors are one or a combination of those recommended by the Corps of Engineers for each specific treatment site.

WDE will evaluate the cost and effectiveness of all treatment measures.

WDE will insure that the contractor applying chemicals for the treatment of milfoil is certified by all applicable local, state, and Federal licensing agencies. At selected sites, WDE will monitor milfoil treatment to evaluate concentrations, persistence, and drift of herbicides. The effectiveness of chemical treatment measures will be monitored, including the percentage of root kill resulting from treatment, and the selectivity of the plant kill.

WDE will monitor and evaluate public awareness of treatment methods used through the use of interviews and questionnaires, in conjunction with the public affairs office of the Corps of Engineers.

WDE will provide the Corps of Engineers with the results of the monitoring and evaluation program and also make the results available to t[illegible] public on request.

1.07.4 Program Evaluation and Monitoring Costs. The total annual cost for evaluation and monitoring of the Aquatic Plant Management Program, that is separable from local administration, WDE supervision, and Corps management cost, is estimated at between \$10,000 and \$40,000 depending on the treatment methods used.

1.08 Mitigation. No mitigation would be required for fish and wildlife loss since only minor impacts are anticipated. Procedures to minimize [illegible]ironmental impacts would be implemented in the prevention [illegible] [illegible]ont[illegible] [illegible]rograms. Procedures to be utilized are listed below.

1.08.1 Mechanical Control. Me[illegible]hanical control would include the removal of affected plants from the water to reduce biological oxygen demand and nutrient release. Containment booms would be used in harvesting an[illegible] [illegible]ovating operations, when necessary, to prevent the spread of [illegible]oil fragments to uninfested waters.

1.08.2 Chemical Control. Chemical treatment would be done by certified applicators following label restrictions under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). Chemicals would be applied at the minimum concentration required to control milfoil to prevent excessive amounts of chemicals being introduced into the aquatic system, and to take advantage of the selective properties of the chemicals (leave as much native vegetation unaffected as possible).

Public notification of chemical usage and appropriate restrictions to water use would be extensive to minimize public exposure to the herbicides. The notification would extend to those areas outside the treatment area which could be subject to herbicide drift.

Site specific considerations would be important in the selection of chemical formulation (e.g., granular formulations of herbicide would be used in those areas in which drift could be a problem).

Chemical treatments would be timed to take advantage of the period of maximum susceptibility of milfoil whenever possible. This would provide more efficient control and, since the optimum period is early in the year during rapid growth (before maximum biomass is reached), would minimize the amount of aquatic vegetation decomposing in the water. Early treatment may not be possible in all cases, however. In areas utilized for salmon spawning and/or rearing, treatment would be timed to avoid peak migration and spawning periods.

1.09 First Year Program Costs. Estimated costs of the first year Aquatic Plant Management Program are presented in the following tables. Additional details are provided in appendix A.

TABLE 3
PREVENTION PROGRAM COSTS

Program Features	
a. Surveillance	$90,000
b. Treatment	30,000
c. Public Awareness	10,000
d. Training	5,000
e. Monitoring and Evaluation	7,000
f. Reporting	4,000
g. Supervision and Administration	54,000
TOTAL ANNUAL	$200,000

TABLE 4
CONTROL PROGRAM COSTS

Lowest Probable Cost	
2,4-D (BEE granular) 100 acres	$8,500
Labor and Equipment	5,500
Contingencies	3,500
Monitoring and Evaluation	33,000
Local Administration	2,000
WDE Supervision	15,500
Corps Management	8,000
TOTAL	$76,000

TABLE 4 (continued)
CONTROL PROGRAM COSTS

Highest Probable Cost

Mechnical Harvesting	
90 Acres @ $530/Acre	$47,700
Fiberglass Bottom Screens	
10 acres @ $9,000/Acre	90,000
Contingencies	13,800
Monitoring and Evaluation	3,000
Local Administration	4,000
WDE Supervision	25,500
Corps Management	8,000
TOTAL	$192,000

TABLE 5
SUMMARY OF COSTS

	Lowest Probable Cost	Highest Probable Cost
Prevention Program	$200,000	$200,000
Control Program	76,000	192,000
TOTAL	$276,000	$392,000
Federal Share	$193,000	$274,000
Non-Federal Share	$83,000	$118,000

1.10 Benefit Analysis. Benefits creditable to the Aquatic Plant Management Program in Washington State are derived from consideration of the loss of water-related recreation opportunities. Benefits have been evaluated separately for the prevention and control programs. Additional details regarding the benefit analysis are provided in appendix B.

1.10.1 Prevention Program. Economic justification for the prevention program is based on the prevention of recreation loss of swimming and beach activity. No recreation benefits are claimed for swimming or beach activity within Rock Island Reach of the Columbia River because no potential for milfoil growth has been identified in this area. Also, no recreation benefits are claimed for swimming or beach activities on the Okanogan River because no public facilities are available on the river. Prevention program benefits are provided in table 6.

TABLE 6
PREVENTION PROGRAM BENEFITS

	1980-2080 Average Annual Equivalent Visitation		Unit Day Value		Average Annual Economic Benefits[1/]
Swimming:					
With Prevention Program	680,392				
Without Prevention Program	444,833				
Recreation Loss	235,559	x	$1.75	=	$412,000
Beach Activity:					
With Prevention Program	840,018				
Without Prevention Program	634,354				
Recreation Loss	205,664	x	$1.75	=	360,000
TOTAL PREVENTION BENEFITS	441,223	x	$1.75	=	$772,000

1/Based on 7-1/8 percent interest.

1.10.2 Control Program. Economic justification for the control program is based on preventing recreation loss (swimming beach and boating activity). Total economic benefits are estimated at $625,000 in 1980, the first year of the control program. Each year thereafter, as the scope of the control program is modified, attributable benefits would be redetermined. Control program benefits are presented in table 7.

TABLE 7
CONTROL PROGRAM BENEFITS

	Recreation Loss		Unit Day Value		Economic Benefits
Swimming	160,154	x	$2	=	$320,000
Beach Activity	132,822	x	$2	=	266,000
Boating					39,000
TOTAL CONTROL BENEFITS				=	$625,000

1.10.3 Overall Benefits. Total estimated average annual benefits are summarized in table 8.

TABLE 8
SUMMARY OF BENEFITS

Prevention Program	$772,000
Control Program	625,000
TOTAL ESTIMATED BENEFITS	$1,397,000

1.11 Benefit-to-Cost Comparison. Total benefits for the overall program are estimated at $1,397,000. First year costs for the combined prevention and control programs are $276,000 for lowest cost treatment and $392,000 for highest cost treatment. The resulting benefit-to-cost ratios are 5.1 to 1 and 3.6 to 1, respectively.

Average annual benefits for the prevention program, based on a 100-year period of analysis and 7-1/8 percent interest, are estimated at $772,000. The first year cost, including supervision and administration, is estimated at $200,000. The benefit-to-cost ratio is 3.9 to 1.

Benefits for the first year of the control program are estimated at $625,000. The first year cost for the control program, including monitoring, administration, and supervision, is estimated to range from $76,000 to $192,000. The resultant benefit-to-cost ratios range from 8.2 to 1 to 3.2 to 1, respectively.

1.12 Program Priorities. The areas to be treated and other related activities would be assigned in the following priority:

Priority 1 (Prevention Program)

Water bodies where the detection and treatment of Eurasian watermilfoil will prevent its spread to navigable waters within the State of Washington.

Priority 2 (Prevention Program)

Public information and education throughout the State of Washington to inform citizens of the presence of Eurasian watermilfoil, the potential problems posed by the plant, and measures to prevent spread of the plant.

Priority 3 (Control Program)

Public-use areas (such as swimming beaches or boat launch ramps) located on navigable waters.

Priority 4 (Control Program)

Other public high-use areas in navigable waters (such as connecting channels to open waters for boaters).

1.13 Schedule and Funding.

1.13.1 Future Program. The first year program is for Fiscal Year (FY) 1980 (October 1979 to September 1980). Beyond FY 1980, if milfoil growth declines, the program would taper off. If the problem increases, the program could be expanded through coordinated efforts of local and state governments and the Corps of Engineers. Local governments, with the Department of Ecology (WDE), would develop an annual statewide work plan for submittal to the Corps of Engineers. The Corps would prepare annual supplements to the design memorandum and the environmental impact statement to be used for requesting approval for changes in the program and submitting budgetary requests. A cooperative agreement between the Corps of Engineers and WDE would be signed for the purpose of administering the program.

1.13.2 Treatment Operations. Chemical control program activities are most effective when accomplished during May, June, and July when initial milfoil growth is taking place. Mechanical harvesting would be done when biomass has reached an optimal level for effective cutting. Fiberglass bottom screens can be placed any time during the year, but is easier in early spring when plants are small. Siltation should also be considered in deciding how long to leave screens down. Most prevention program activities can be carried out any time during the year, but spot treatment of areas with chemicals are most effective during May through July. Coordination with the Washington State Department of Fisheries would be done when scheduling treatment activities to insure the protection of fisheries resources.

1.13.3 Funding. Fiscal year 1980 funding requirements for the Aquatic Plant Management Program are as follows:

TABLE 9
FY 1980 FUNDING REQUIREMENTS

	Treatment Methods	
	Low Cost	High Cost
Federal (70 percent)	$193,000	$274,000
Non-Federal (30 percent)	83,000	118,000
TOTAL FUNDING REQUIREMENTS	$276,000	$392,000

2. ENVIRONMENTAL SETTING WITHOUT PROJECT

2.01 Statewide.

2.01.1 Climate. The climate, as well as the topography, of Washington varies considerably from west to east. West of the Cascades the climate is influenced by Pacific Ocean breezes and the warm North Pacific Drift, an extension of the Japan Current, resulting in mild temperatures year round.

Rainfall west of the Cascades averages 36 inches, but has wide variations (see figure 13). Most of western Washington has its rainfall spread lightly over a fairly long period, with the heaviest usually occuring in December. The summer months, especially July and August, are relatively dry.

The Cascade Mountains protect western Washington from cold air from the interior. As a result, the coastal areas receive only about 5 inches of snow per year and the Puget Sound Basin receives only about 10 inches.

The average winter temperature in western Washington is 35° to 40° F, the summer average is 60° to 70° F. The summer daily maximum is 74° F.

Eastern Washington is located between the Cascades, which cast a "dry shadow" over a large area, and the Rocky Mountains which provide some protection from severe storms originating in the interior. It has a more arid climate than the coast and also has a greater temperature variance. Rainfall is low over the Columbia Basin and the Okanogan Highlands, ranging from 10 to 20 inches per year. From 10 to 60 inches of snow falls on this area per year, depending on the elevation. The winters in eastern Washington are characteristically cold and the summers are hot. Mean temperatures range from 25° to 35° F in the winter and from 63° to 77° F in the summer. The growing season averages from 80 to 200 days.

2.01.2 Soils. Considering soils in a west to east gradient (see figure 13), those near the Pacific Coast are made up of moderately deep to shallow loams, gravelly loams, and silty clay loams with fine grained alluvial deposits.

In the Puget Lowlands soil permeability is high. Gravelly/stony loams are formed in the alluvium. Perched ground water tables occur at 2 to 3 feet below ground level. The depths to cobble and gravel are usually between 2 to 5 feet. The potential for wind or water erosion is low.

In the Cascade Range, glacial drift, colluvium, and alluvium overlie bedrock over much of the area. Soils are mostly shallow, gravelly, and stony.

2.01.3 Life Zones. The highly diverse topography and climatic conditions of Washington create many different habitat types. The major habitat types, grouped by dominant plants and associated animal species, are known as life zones. Six of the major life zones of North America occur in Washington (see figure 14).

ARCTIC-ALPINE ZONE. This zone is restricted to the high peaks of the Cascades and Olympic Mountains. It has the harshest climate of any in the state and the vegetation is covered by heavy snow 8 to 9 months of the year.

HUDSONIAN ZONE. This zone consists of the belt of rather open forest which is found immediately below the Arctic-Alpine Zone. The dominant trees are conifers and there is a rich understory of shrubs. Very heavy snows fall in winter and the period of vegetational activity is short: from 3 to 5 months depending upon slope, exposure, and altitude.

CANADIAN ZONE. The tall dense conifer forests of the Canadian Life Zone extend in unbroken stretches over the entire length of the Cascades on both sides of the crest and are also found in the Olympic Mountains and on the higher ranges of the eastern part of the state. A rich understory of shrubs occurs in many areas, but the diverse wet meadows of higher elevations are scarce and scattered. Snow cover is deep, but because of milder climatic conditions, the ground becomes exposed sooner in the spring and there is a moderately long growing season for plants.

TRANSITION ZONES. Below the Canadian Zone, on the western slopes of the Cascades, the lush forests of the lowlands of western Washington are found. On the east slopes of the Cascades, however, the climate gets progressively drier with decreasing altitude and the denser forests give way to open forests and eventually grasslands and desert. The great differences in the Transition Zones on the two sides of the mountain require that they be discussed separately.

HUMID TRANSITION. The tall forest of the Humid Transition Life Zone are dominated by Douglas fir, western red cedar and western hemlock. This zone sustains the densest human populations in the state and, because the tall forests of this area were the most accessible to logging, virtually all of the virgin forests were cut many years ago. Only small patches of uncut forest remain and most areas are in various stages of succession. Pressures for alternative uses of this zone are strong, but because of the high population densities in the area, the needs for recreational uses are also very strong.

ARID TIMBERED TRANSITION. At higher elevations this forest is similar to that of the Canadian Zone. With decreasing elevation, however, several species drop out and are replaced by Douglas fir and then by ponderosa pine. Ponderosa pine forms almost pure stands on the lower slopes just above the grasslands. In wetter sites there is a rich understory of shrubs and the river bottoms support a distinctive vegetation dominated by deciduous trees with dense understories

Natural Inf
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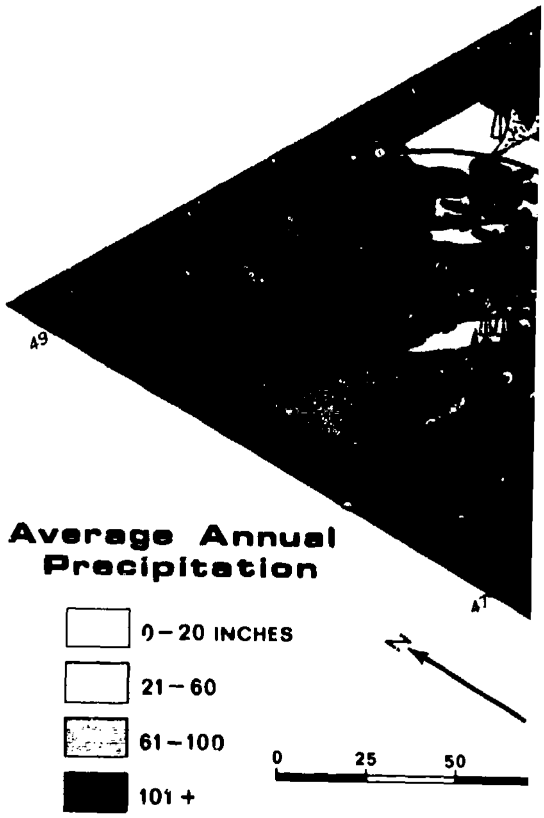
WASHINGTON



SOURCE FRANKLIN, J. F. AND DYRNESS, C. T.,
NATURAL VEGETATION OF OREGON AND WASHIN
U.S.D.A. FOREST SERVICE GENERAL TECHNICAL I
PNW-8, 1973.

SOIL CONSERVATION SERVICE, GENERAL SOIL MA
WASHINGTON, PREPARED BY RAY W. CHAPIN, SP
WASH., 1968.

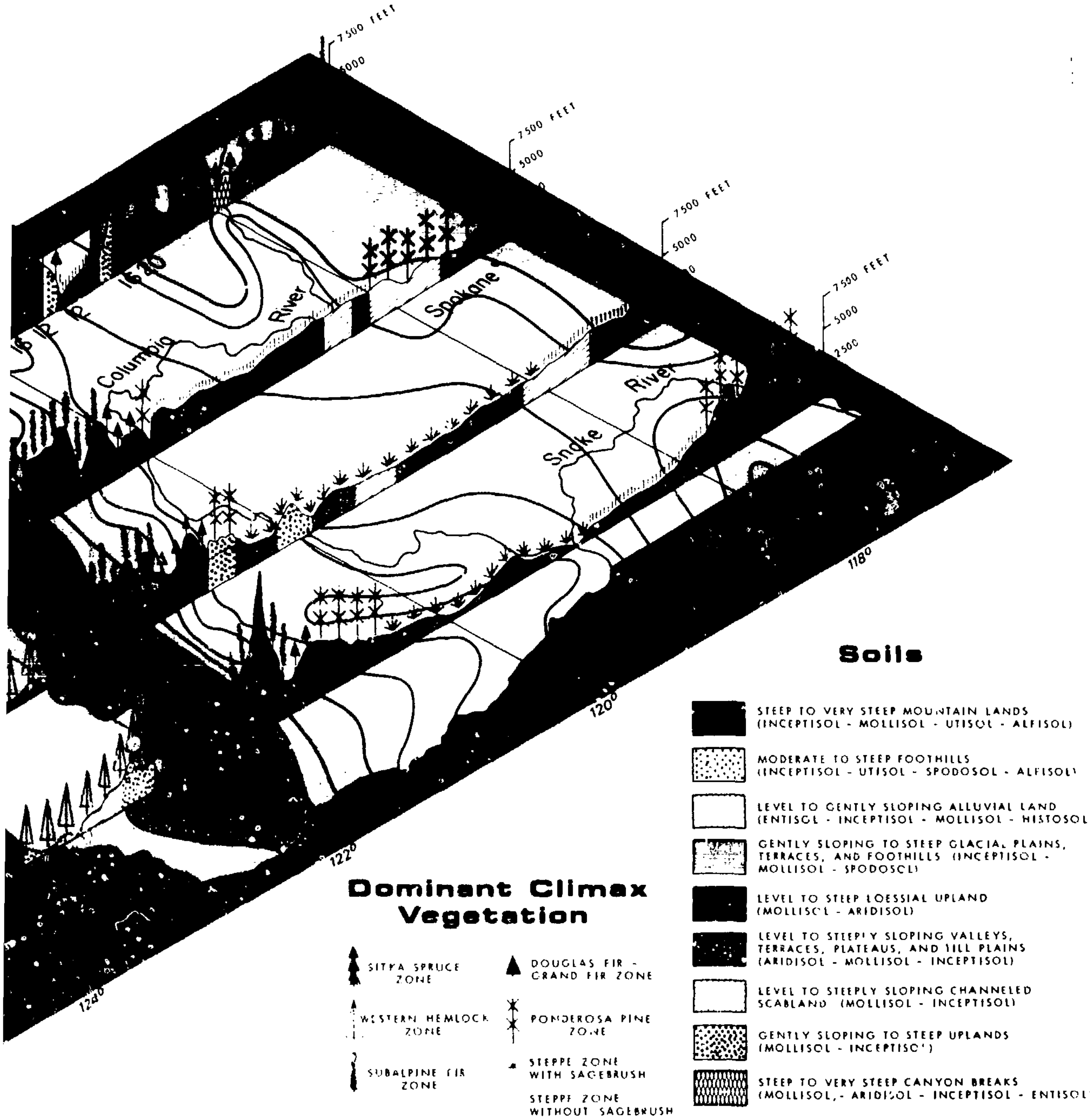


FIGURE 13

From Washington Environmental Atlas
January 1975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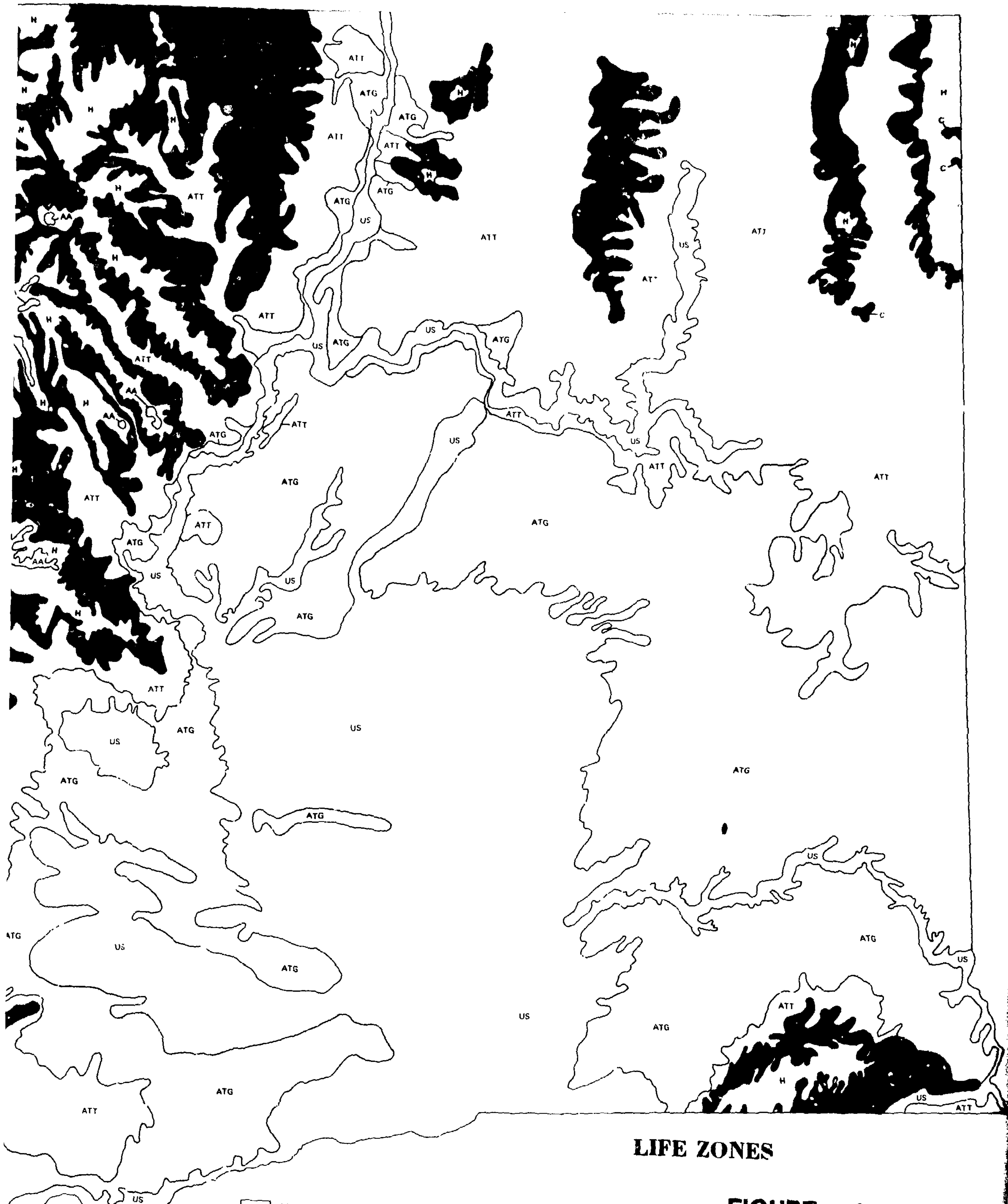

LIFE ZONES

	AA	ARCTIC ALPINE (OLYMPICS 5500 +, CASCADES 6500 +)
	C	CANADIAN (2000 TO 5000)
	H	HUDSONIAN (3000 TO 6600)
	HTT	HUMID TRANSITION TIMBERED (SEA LEVEL TO 1500 3000,
	HTP	HUMID TRANSITION PRAIRIES (SEA LEVEL TO 500)
	US	UPPER SONORAN (200 TO 1900)
	ATT	ARID TRANSITION TIMBERED (1800 TO 3000)
	ATG	ARID TRANSITION GRASSLAND (1500 TO 2400'

FIGURE 14

From Washington Environmental Atlas
January 1975

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of shrubs and herbaceous plants. Winters are cold and there is considerable accumulation of snow at the higher elevations, but this decreases at lower elevations.

In this ponderosa pine zone the slopes are usually bare by early April. Summers are long, usually hot and dry. Because of drier conditions, the forest of the Arid Timbered Transition Life Zone are more open and characterized by an abundance of many species of grasses.

ARID GRASSLAND TRANSITION. The open ponderosa pine forest of the eastern slopes of the Cascades, the lower slopes of the Blue Mountains, and the mountains of northeastern Washington give way to a belt of grasslands commonly known as the Palouse Prairie. Temperatures are favorable for terrestrial plant growth most of the year, but production is severely limited by moisture shortage during late spring, summer, and autumn.

This zone is extremely favorable for agriculture, particularly for the production of wheat, so that most of the original vegetation has been destroyed.

UPPER SONORAN ZONE. The lowlands of the Columbia Basin are extremely arid and support a shrub-steppe vegetation with various grasses and herbs growing among the shrubs. Winters are mild and summers are long and hot, but there is little vegetative productivity because of moisture shortage. The area is too dry for dryland farming, but the soils are excellent when irrigated and this area is rapidly being modified by expanding irrigation. Its lakes and marshes are unusually productive and some of the most important waterfowl wintering and breeding grounds are found here (U.S.A.C.O.E., 1975).

2.01.4 Water Quality. Generally, the water quality in Washington's rivers and streams has improved since 1972, with additional improvement expected for the next 3 to 5 years. With some exceptions, river and stream water quality meets the goals of the Federal Water Pollution Control Act for use by wildlife, for recreation, navigation, agriculture, industry, and for the propagation of fish and shellfish.

The only principal rivers in Washington not meeting Federal water quality goals are portions of Crab Creek in Grant County, the Palouse River in Whitman County, the Walla Walla and Touchet Rivers in Walla Walla County, and the Spokane River in Spokane County. The most common problems for Washington's rivers and streams are excessive nutrient concentrations, high turbidity, and high bacteria levels.

The lakes and reservoirs of Washington are undergoing a natural process of aging called eutrophication. When a water body becomes highly eutrophic, it is characterized by dense algal blooms, floating mats of aquatic vegetation, and a murky appearance. These conditions may directly curtail or eliminate water recreation activities such as swimming, boating, and fishing; impart tastes and odors to water supplies; hamper industrial and municipal water treatment; and adversely

affect aquatic ecosystems. The process of eutrophication can be speeded by human activities.

Of the 19 lakes and reservoirs in Washington which have at least 10 square miles of surface, one (Moses Lake) is already eutrophic and nine are mesoeutrophic, well on their way to becoming eutrophic (although the time frame to eutrophy is not predictable). These water bodies are all located in eastern Washington. Seven other lakes are mesotrophic (have a moderate level of algae production) and two are oligotrophic (relatively pristine).

Of the 30 most used recreational lakes in Washington, two have significant impairment of recreational use and six have moderate impairment due to eutrophication. In general, these lakes and reservoirs are receiving municipal, industrial, or agricultural wastes (EPA, 1978).

2.02 Seattle Area (Lake Washington, Lake Sammamish, and Lake Union). All areas proposed for treatment in 1980 in western Washington are in the Seattle area: Lakes Washington, Sammamish, and Union (Portage Bay).

2.02.1 Climate. The Seattle area climate is predominantly a midlatitude, west coast marine type. Most air masses reaching Puget Sound have their source over the Pacific Ocean. The maritime air has a moderating influence in both winter and summer. The prevailing wind is from the southwest in fall and winter, gradually shifting to northwest in late spring and summer. There is a well-defined dry season in summer and a rainy season in winter.

Maritime air reaching the Washington coast in late fall and winter is moist and near the temperature of the ocean's surface. Orographic lifting and cooling air masses move inland resulting in cloudiness and widespread precipitation patterns. Precipitation is light in summer, increasing in fall, reaching a peak in winter, then decreasing in spring with a slight increase in May and June followed by a sharp drop near the first of July. Most of the winter precipitation falls as rain in elevations below 1,500 feet, as rain or snow between 1,500 and 2,500 feet.

The number of clear or only partly cloudy days each month is from 4 to 7 in winter, 10 to 15 in spring and fall, and 20 or more in summer. The amount of sunshine received is approximately 20 percent in winter, 40 to 50 percent in spring and fall, and 60 to 70 percent in summer. Frequently in summer and fall, fog or low clouds, 1,000 to 2,500 feet in depth, form over the Sound and lowlands during the night, then disappear by afternoon (WSU, 1968).

2.02.2 Economic Base. The Seattle-Everett Standard Metropolitan Statistical Area (SMSA) is comprised of King and Snohomish Counties. The combined population of this two county area was 1,497,200 in 1978, which amounted to 40 percent of total state population. Manufacturing accounts for the largest share of employment and wages paid

in the Seattle-Everett SMSA. The five largest manufacturing employers are the Boeing Company, Pacific Car and Foundry Co. (a division of PACCAR, Inc.), Weyerhaeuser Co., Scott Paper Company, and Lockheed Shipbuilding Co., Inc. Although manufacturing remains an important employer in the Seattle-Everett SMSA, the industrial mix of the area since 1968 has shifted from manufacturing to the trade and service sectors. Construction and finance, insurance, and real estate employment have also grown significantly. Part of the diversification of the Seattle-Everett SMSA may be credited to the increased development of the Port of Seattle.

2.02.3 Fish and Wildlife. The Seattle area is located in a Humid Transition Life Zone which would be dominated by Douglas fir, western red cedar, and western hemlock except that most of the available land has been taken up by residential, commercial and industrial development, eliminating much of the wildlife habitat.

Lake Washington, Lake Sammamish and, to a lesser degree, Portage Bay, have important fish and wildlife areas. Lake Washington and Lake Sammamish have several ecologically important marshes containing large numbers of submerged and emergent aquatic plants which provide food, shelter, and nesting areas for numerous species of fish, waterfowl, and other wildlife.

The Lake Washington system contains 36 species of fish. It is a major rearing area for sockeye salmon (Oncorhynchus nerka) and other anadromous fish. Some sockeye salmon spawn around the shore. Fall chinook (O. tshawytscha) are taken off the mouth of the Cedar and Sammamish Rivers from late August through early October. Coho salmon (O. kisutch) are caught at the mouth of the Sammamish River in early November. Populations of largemouth and smallmouth bass and other assorted panfish are also abundant (U.S.A.C.O.E., 1975).

2.02.4 Air Quality. The Seattle area fails to meet EPA air quality standards about 98 days per year. The main problem is from carbon monoxide emissions from automobiles. Also, photochemical oxidants and suspended particle concentration are high. The incidents of these violations, however, have been decreasing (EPA, 1978).

2.02.5 Water Quality.

2.02.5.1 Lake Washington. Lake Washington is characterized as mesotrophic, having no serious algae problems. Rated for bacteria levels, health of the fish population, percent of surface area affected by aquatic weeds, and water clarity, Lake Washington has the highest EPA rating for recreational use (EPA, 1978).

The water quality in Lake Washington has improved greatly since the diversion of sewage away from the lake was started by the Municipality of Metropolitan Seattle in 1963, but sewage overflows still occur during storm runoffs, causing localized problems.

2.02.5.2 Lake Sammamish. Lake Sammamish is showing symptoms of eutrophication. Its condition at this time corresponds to that of Lake Washington in the 1950's prior to extensive sewage interception. Lake Sammamish is adversely affected by municipal waste and by land management practices, resulting in bacterial contamination and nutrient enrichment which increases algal activity (U.S.A.C.O.E., 1975).

These problems are not yet impairing recreation, however, as the lake also has the highest EPA rating for recreational use (EPA,1978).

2.02.5.3 Portage Bay (Lake Union). The water quality of Portage Bay is generally good. The main problem in the bay is caused by sewage overflows during storm runoffs. The nutrients introduced in the overflows, along with some industrial discharge and discharge from private boats, causes moderate algal blooms in the summer and, along with nutrients in the sediment, support lush aquatic vegetation.

2.02.6 Upland Setting.

2.02.6.1 Lake Washington. The shoreline of Lake Washington is almost completely taken up by residential and commercial development with a large number of small parks scattered around the lake. The treatment areas proposed for 1980 are adjacent to public swimming beaches or areas of high-density residential development having large numbers of private boating structures and heavy infestations of milfoil. The native terrestrial vegetation, for the most part, has been replaced by lawns and ornamental plants.

2.02.6.2 Lake Sammamish. Lake Sammamish is not as heavily developed as Lake Washington, but residential development is progressively eliminating open space on the lake shore. The only area on Lake Sammamish proposed for treatment in 1980 is the State Park swimming beach and boat launch area. Much of the native upland vegetation at this site has been replaced by park landscaping.

2.02.6.3 Lake Union (Portage Bay). The east and west shores of Portage Bay are dominated by commercial and industrial development. The Seattle Yacht Club and the Queen City Yacht Club extend far out into the bay from both shores. A majority of the south shore is taken up by the Montlake playground, natural marsh areas, houseboat moorage, and residential development. The marsh areas provide waterfowl habitat and are the only natural area remaining on the bay.

2.02.7 Aquatic Vegetation.

2.02.7.1 Lake Washington. The Lake Washington littoral zone supports aquatic plant growth all around the lake except in areas of rocky bottoms and high wave action and in areas with steeply graded shorelines. Sheltered shallow water areas, natural bays, and the lee side of man-made structures, provide the best growing areas for aquatic plants.

The predominant aquatic plants in Lake Washington are Potamogeton berchtoldii (pondweed) and milfoil. Also common are Richardson's pondweed (P. richardsonii), curly leafed pondweed (P. crispus) and elodea (Elodea canadensis). Found in significant amounts are coontail (Ceratophyllum demersum), muskgrass (Chara spp.), rushes (Juncas spp.), yellow pondlily (Nuphar variegatum), fragrant white-pink pondlily (Nymphaea odorata), variable pondweed (P. gramineus), stonewart (Nitella sp.), and cattails (Typha latifolia).

2.02.7.2 Lake Sammamish. Aquatic vegetation in Lake Sammamish is concentrated mainly in the north and south ends and is dominated by milfoil. The other species found are basically the same as found in Lake Washington.

2.02.7.3 Lake Union (Portage Bay). Aquatic vegetation in Portage Bay is generally patchy. The most common species present are pondweed, curly leafed pondweed, milfoil, and elodea.

Also found in significant concentrations are rushes, yellow pondlily, fragrant white-pink pondlily, Richardson's pondweed, and cattails.

2.02.8 Water Usage. The primary use made of Lake Washington, Lake Sammamish, and Portage Bay waters is navigation, recreation, moorage, esthetic enjoyment, and fish reproduction, rearing, and harvest. There are many private property owners who pump small amounts of water for irrigating lawns and gardens.

2.02.9 Recreation. Because of their proximity to the large population of the Seattle area, Lake Washington, Lake Sammamish, and Portage Bay are subject to heavy recreational demand. In the warmer months, swimming, boating, water-skiing, and fishing are extensively pursued on these lakes (boating continues year round). In addition, many other people are attracted for nonwater-related recreation at parks and private residences because of the esthetics.

The water-related recreational activities are beginning to be impacted by aquatic weed growths in high-use areas.

2.02.10 Historic, Archeologic, and Cultural Resources. The project area has been used and occupied by human populations for several millenia. At the time of Euro-American contact, during the first half of the 19th century, there were Duwamish, Sammamish, and Snoqualmie Indians residing in the region. These people followed a hunting-fishing-gathering subsistence pattern and had established permanent winter villages. After the mid-1800's, the indigenous populations were largely relocated and a period of homesteading and incipient urbanization insued. The latter process with related developments has continued to the present.

Historic and, to a lesser extent, prehistoric cultural resources are present in the project area. Intensive human use and development of much of the region in recent times has served to obliterate considerable prehistoric and early historic evidence. The National Register

of Historic Places (6 February 1979) lists several significant properties in the project area including the Marymoor Prehistoric Indian Site, the Chittenden Locks and Lake Washington Ship Canal Historic District, and the Naval Military Hangar - University Shell House among others.

2.02.11 Sensitive Areas. Marsh areas are very important to the ecology of Lake Washington, Lake Sammamish and Portage Bay. Because of the nature of aquatic plant growth, these important natural areas are also the areas experiencing the worst problems with milfoil. Care must be taken in the selection of control methods to insure that the fish and wildlife values at sensitive sites are protected. These areas are depicted on figures 4a through 12.

2.03 Okanogan Area (Osoyoos Lake and Okanogan River).

2.03.1 Climate. In the Okanogan Valley, summers are sunny, warm, and dry with some very hot days. Winters are cloudy and cold with some fog. The Cascades form a barrier to easterly movement of comparatively mild moist air in winter and cool air in the summer. The Rocky Mountains shield the area from cold air out of the north during the winter.

During the warmest summer months, afternoon temperatures in the lower valleys range from the high 80's to the low 90's (degrees F.) and reach 100° or higher at times. Average minimums are in the 50's, producing a daily temperature range of about 25 to 30°. In the winter, average maximum temperatures are in the 30's and low 40's, while minimums are in the 10's and low 20's.

Precipitation in this area is light in summer, increases in the fall, reaches a peak in winter, and then gradually decreases in the spring (see figure 13). Precipitation in May and June can be somewhat erratic, but there is usually a slight increase after April followed by a sharp drop near the first few days of July. Two-thirds of the annual precipitation falls between October and March. Most precipitation between mid-December and mid-February falls as snow. The average winter snowfall ranges from 20 to 35 inches. The number of clear or only partly cloudy days each month ranges from 4 to 8 in winter, 6 to 14 in spring and fall, and 20 or more in summer. The amount of sunshine received is about 33 percent in winter, 50 to 70 percent in spring and fall, and 75 to 85 percent in summer (WSU, 1975).

2.03.2 Economic Base. The Okanogan River traverses the length of Okanogan County, the largest county in the state in land area. County population was estimated at 29,000 in 1978 (22nd of 39 counties in the state), an increase of 12.1 percent from a 1970 population of 25,867. The Colville Indian Reservation is located in the southern part of the county. Forestry and agriculture are the major industries in Okanogan County.

Oroville is the town closest to the aquatic weed infestation area. As with the county, the town of Oroville is dominated by agricultural and forest product industries. As the nearest U.S. city to the Canadian Okanagan (Canadian spelling), Oroville also serves as a sub-regional trading hub for local Canadian citizens.

Economic pressures from Canada have helped expand retail sales and land development during the past 20 years at a greater rate than demanded by the local population. However, even with continued economic pressure from Canada, the rate of future area development is expected to remain modest. No new industrial development is foreseen. Agriculture and wood processing are expected to remain the major industrial activities.

2.03.3 Fish and Wildlife. The Okanogan Valley is a critical deer-wintering ground and is an important area for waterfowl, long-billed curlew, grouse, grasshopper sparrow, and the white-tailed jackrabbit.

Much of the natural vegetation around Osoyoos Lake has been replaced by residences and fruit orchards. The remaining lake shore and the river-edge vegetation provides food, cover, and nesting areas for a number of resident and migratory song birds. The Okanogan Valley is part of the Pacific Flyway and waterfowl nesting occurs along the river.

Anadromous fish populations in the Okanogan River system include summerrun chinook, sockeye, and steelhead trout (*Salmo gairdneri*). These species make use of the river system for spawning.

Resident game fish include rainbow trout (*Salmo gairdneri*), brown trout (*S. trutta*), cutthroat trout (*S. clarki*), brook trout (*Salvelinus fontinalis*), Dolly Varden (*S. malma*), bass (*Micropterus* spp.), crappie (*Pomoxis nigromaculatus*), whitefish, and sunfish (*Lepomis gibbosus*). Nongame fish include chub, suckers (*Catastomus* spp.), squawfish (*Ptychocheilus oregonensis*), catfish (*Ictalurus* spp.), and carp (*Cyprinus carpio*).

2.03.4 Air Quality. The major air quality problem in Okanogan County is the relatively high level of suspended particles. The main source of these high levels are windblown dust, dust from dirt roads and emissions from orchard heaters, sawdust burners, and other local industries.

EPA standards were not exceeded between 1973 and 1976 for carbon monoxide, photochemical oxidants, sulfur dioxide, or nitrogen dioxide.

2.03.5 Water Quality.

2.03.5.1 Okanogan River. The Okanogan River meets Federal water quality goals but there are some problems. Irrigation return waters increase the levels of nutrients and soil salts in the river, and solar heating of the irrigation water contributes to increased water temperatures. As a result, the river's capacity to assimulate

treated waste may be reduced and anadromous fish passage is impaired. The lower reaches of the Okanogan River experience high coliform bacteria counts below the population centers of Omak and Okanogan. Sewage treatment plant outflows are probably the main cause.

2.03.5.2 Osoyoos Lake. Osoyoos Lake is classified as mesoeutrophic due to its high nutrient content and biological productivity. The lake supports lush populations of aquatic vegetation, and algal blooms are increasingly becoming a problem. Swimmer complaints regarding skin and eye irritation have also been increasing.

Water quality in Osoyoos Lake is affected by agricultural runoff and septic tank seepage from lakeside residences. There are, however, no municipal or industrial wastewater discharges into the U. S. portion of Osoyoos Lake.

Due to the rapid flushing of the Lake (8½-month retention time) pollutants are not significantly accumulated. The water quality is largely dependent upon the water quality of Okanagan Lake and Vaseux Lake located upstream.

2.03.6 Upland Setting.

2.03.6.1 Okanogan River. The Okanogan River flows through three major population areas, Oroville, Omak, and Okanogan. The Okanogan River floodplain is generally less than one mile wide.

The upper end of the Okanogan is ponded by Zosel Dam, creating marshy lakeshore-like areas. The remainder of the river, outside of population centers, has thin strips of riparian vegetation with most of the floodplain taken up by agricultural and pasture land.

2.03.6.2 Osoyoos Lake. Osoyoos Lake has a large number of residences along the shore. The southern end of the lake is adjacent to the town of Oroville and is primarily residential. The Osoyoos State Park is located just north of the town. Because of the residential and recreational development, much of the natural vegetation has been replaced by introduced species.

2.03.7 Aquatic Vegetation.

2.03.7.1 Okanogan River. The upper end of the Okanogan River is ponded and marshy. It contains bulrushes (*Scirpus microcarpus*), cattails (*Typha latifolia*), and a variety of pondweeds. The remainder of the river is faster moving and subject to scouring which limits aquatic growth mainly to backwater areas. There have been reports of small milfoil colonies in the upper part of the river.

2.03.7.2 Osoyoos Lake. Osoyoos Lake contains mainly bulrushes, various pondweeds and elodea with some Eurasian watermilfoil and native watermilfoil. The patches of Eurasian watermilfoil have been treated with 2,4-D for the past 2 years by the Washington Department of Ecology in an attempt to prevent their spread and expansion.

2.03.8 Water Usage. The waters of the Okanogan River and Osoyoos Lake are extensively used for irrigation. Agriculture is an important part of the counties economy with apple production accounting for about two-thirds.

Recreation and esthetic enjoyment is also important in Osoyoos Lake, with a state park located at the southern end and many vacation homes along the shore.

2.03.9 Recreation. The state park at the southern end of Osoyoos Lake has a swimming beach, two boat launching ramps and picnic areas. The City of Oroville owns a park to the north of the state park and also provides boat launching and swimming. There are also many vacation homes along the shoreline. The lake provides swimming, boating, water-skiing and fishing in the warm months and ice sailing and ice fishing in the winter.

The Okanogan River provides swimming, fishing, canoeing, and waterfowl hunting.

2.03.10 Historic, Archeologic and Cultural Resources. The project is situated in the area traditionally occupied by the Upper Okanogan Indians, one of the tribal groups which constitute the modern Colville Confederated Tribes. This Native American group practiced a seasonal subsistance pattern which took them into many diverse environmental zones within the region for the purpose of obtaining a wide variety of plants and animals. The Okanogan River and the shores of Osoyoos Lake, however, were the focus of most activity for these peoples. The major winter villages, fishing sites, freshwater clam gathering sites and burial sites, and thus cultural resource sites spanning many thousands of years, were concentrated along these waters.

Two more recent sites, the Enloe Dam and Power Plant and the Hiram F. Smith Orchard, are currently listed on, or determined eligible for inclusion on, the National Register of Historic Places.

2.03.11 Sensitive Areas. The marsh areas on Osoyoos Lake and the Okanogan River are important fish and wildlife areas. Care should be taken to insure that the treatment of aquatic plants will not adversely affect these values.

The irrigation intakes are also sensitive areas. Care must be taken that chemicals, which may be used to treat aquatic plants, are not present in water used to irrigate susceptible agricultural or ornamental species.

3. RELATIONSHIP OF THE PROPOSED PROJECT TO LAND-USE PLANS

3.01 Federal Projects. The authorization for work under the proposed Aquatic Plant Management Program specifically excludes weed control for the operation and maintenance of reservoirs, channels, harbors, or other water areas of authorized projects under jurisdiction of the Corps of Engineers or other Federal agencies. Close coordination will be undertaken with local interests and the State of Washington to insure that the program will not overlap or conflict with Federal agencies.

3.02 Federal Regulations. Work in waters of the United States, and associated wetlands, is regulated by the Corps of Engineers. Permits for work can be issued under Section 10 of the River and Harbor Act of 1899 or under Section 404 of the Clean Water Act of 1977.

Some of the proposed control or prevention methods would require one or both of these Department of the Army permits. The local sponsor would be responsible for obtaining the necessary approval. (The two major alternatives, mechanical harvesting and chemical treatment, would not require Department of the Army permits.) Chemical treatment would have to comply with the 1978 amendments to the Federal Insecticide, Fungicide and Rodenticide Act, which is monitored by the Environmental Protection Agency, but no Federal permit would be required.

3.03 State Laws and Regulations. Obtaining the required state permits would be the responsibility of the local sponsor.

3.03.1 Substantial Development Permit. The State of Washington, under the Shoreline Management Act of 1971, requires permits for the development of shorelines of statewide significance. Some local governments may require that a substantial development permit be obtained prior to use of the chemical treatment alternative. The structural methods (fiberglass bottom screens and fragment barriers) may also require a substantial development permit.

3.03.2 Water Quality Permit. The State of Washington regulates the use of herbicides in public waters through the issuance of permits for short-term modification of Water Quality Criteria under WAC 173-201-035(8)(e).

3.04 Local Government Land-Use Plans. The local government sponsors would, in most cases, propose the control work and would fund 30 percent of the cost. This should insure that the work complies with the local land-use plans.

3.05 Other Ongoing Studies.

3.05.1 Municipality of Metropolitan Seattle. The Municipality of Metropolitan Seattle (METRO), in conjunction with the Washington State Department of Ecology (WDE) and the University of Washington, has been testing milfoil control methods in Union Bay. They harvested plots of milfoil and placed fiberglass bottom screens on other plots in the summer of 1978. Their testing continued through the summer of 1979. METRO is also conducting a literature review and data analysis on the use of 2,4-D.

3.05.2 Washington Department of Ecology. WDE, in April 1979, prepared a draft state environmental impact statement (EIS) concerning 2,4-D and endothall applications in Lake Washington proposed for June 1979. The final EIS was released 23 May 1979. Based on their review, WDE granted permission for the treatment. WDE's decision was appealed to the State Pollution Control Hearing Board by a coalition of environmental groups. The appeal was dismissed, the permit granted, and the applicant proceeded with the proposed chemical applications. A temporary restraining order resulted in the suspension of chemical treatment before completion of the permitted work. The court case was eventually dropped when the coalition of environmental groups withdrew because of lack of funding. The chemical treatment was subsequently completed.

In coordination with Seattle District, WDE has initiated a limited control program in Osoyoos Lake and the Okanogan River. The 1979 program included public information efforts, aquatic plant surveys of Osoyoos Lake, removal of small colonies of milfoil identified in Osoyoos Lake, and operation of a plant fragment barrier and screen across the Okanogan River downstream of Osoyoos Lake.

3.05.3 U.S. Army Corps of Engineers Waterways Experiment Station. In 1979 The Waterways Experiment Station (WES) began a Large Scale Operations Management Test (LSOMT), a 3-year study to evaluate the concept of prevention as an operational management method for the control of milfoil. WES will be evaluating the effectiveness of fragment barriers, aerial surveillance, and surveillance by scuba divers. They will also implement a program of public information and conduct aquatic plant identification and control workshops to train Federal, state, and local agency personnel.

Field testing will initially occur in Lake Sammamish, Lake Whatcom, Lake Osoyoos, and the Okanogan River. Findings of the LSOMT will be incorporated into the statewide Aquatic Plant Management Program and, because of the wide range of conditions at the test sites, could be extrapolated for application to future management programs.

3.05.4 Seattle Parks Department. In August of 1979, the Seattle Parks Department installed bottom screens at Seward, Madrona, and Pritchard Island Parks for the control of aquatic plants.

4. PROBABLE IMPACTS OF THE PROPOSED ACTION ON THE ENVIRONMENT

4.01 Impacts on Air Quality, Noise and Traffic.

4.01.1 Mechanical Harvesting. Only minor adverse impacts on air quality, noise levels, and traffic are expected to result from the use of mechanical harvesters. Air quality would be affected by exhaust emissions from the harvester and from the trucks required to transport the harvested plants to disposal sites. There would also be increased noise and traffic caused by the haul trucks transporting harvested plants to disposal sites. All these impacts should be minor and of short duration.

4.01.2 Rotovating. The impacts to air quality, noise levels, and traffic caused by rotovator operation would be basically the same as those caused by mechanical harvesting.

4.01.3 Suction Dredge. The suction dredge should have only a minor effect on air quality and noise and no effect on traffic. The dredge would be powered by an outboard motor which would emit exhaust and increase noise levels. Also, power would be required to operate a compressor and suction hoses for the divers. This would increase emissions and noise, but the impact should be minor and temporary.

4.01.4 Hand Removal. There would be no impact on air quality, noise, or traffic caused by the hand removal of milfoil.

4.01.5 Chemical Control (all alternatives). The only impacts to air quality, noise, and traffic which would be caused by chemical treatment are those associated with the use of the applicator and chase boats. There would be a small amount of exhaust emissions and a small increase in noise. The chemical would be in a granular formulation or, if liquid, would be applied below the water surface to prevent aerial drift.

4.01.6 Fiberglass Bottom Screens. The installation of fiberglass bottom screens would have no effect on air quality, noise, or traffic beyond those associated with the use of a boat during installation.

4.01.7 Aerial Surveillance. Aerial surveillance would have a minimal effect on air quality, noise, or traffic if it were incorporated into existing photo missions. If conducted independently, there would be exhaust emissions and noise associated with the use of an aircraft.

4.01.8 Ground Surveillance. The ground surveillance program would have a slight effect on air quality because of exhaust emissions from cars or boats and would also slightly increase noise and traffic. This impact would be very minor and would be minimized by incorporating the program with existing field activities.

4.01.9 Fragment Barriers. Only minor, short term effects would result to air quality and noise due to the use of machinery during the installation and maintenance of fragment barriers.

4.01.10 Public Information. The public information program would have minor short-term effects on air quality, noise, and traffic resulting from vehicular use.

4.02 Esthetics.

4.02.1 Mechanical Harvesting. Mechanical harvesting should have a positive effect on esthetics by preventing milfoil from growing to the surface and forming mats which are unsightly and tend to collect debris. By removing part of the biomass from the water, it will decrease the volume of milfoil washing up and decomposing on the shore in the fall.

There would be a short-term negative impact on esthetics associated with having the necessary equipment on the water.

4.02.2 Rotovating. The long-term effect on esthetics caused by rotovating should be positive as outlined for mechanical harvesting.

With rotovating, however, there would be short-term adverse impacts related to the disruption of the substrate. Water turbidity would be greatly increased and silt could be deposited on beaches during operations in soft bottom areas. Also, rotovating would have the same adverse effect on esthetics as harvesting due to the equipment on the water.

4.02.3 Suction Dredge. The positive effects noted for mechanical harvesting could be extended to the suction dredge but the area covered would be so small that they would be negligible. Suction dredging also would have a minor short-term impact on esthetics due to the presence of dredge and associated equipment.

4.02.4 Hand Removal. Hand removal of small patches of milfoil will have a minimal beneficial effect on esthetics.

4.02.5 Chemical Control (all alternatives). Chemical control of milfoil would have the same beneficial impacts on esthetics as noted for mechanical harvesting. The milfoil would be stressed during the growing season and thus have less biomass during winter dieback. There should be no adverse impacts on esthetics.

4.02.6 Fiberglass Bottom Screens. Bottom screens should have no adverse impact on esthetics. There would be the same positive effects as noted for mechanical harvesting, but the area affected would be very small in comparison.

4.02.7 Aerial Surveillance. Aerial surveillance would have no effect on esthetics.

4.02.8 Ground Surveillance. Ground surveillance would have no effect on esthetics.

4.02.9 Fragment Barriers. Barrier structures spanning a waterway would have a negative impact on esthetics. They would be in place for long periods and would tend to collect floating debris.

4.02.10 Public Information. The public information program would have a minor effect on esthetics. The program calls for posting signs at public recreation areas.

There would be a positive effect on esthetics if the program is successful in stopping milfoil spread by human activities such as boating.

4.03 Impacts on Water Quality.

4.03.1 Mechanical Harvesting. The effects of mechanical harvesting on water quality should be beneficial. Large-scale harvesting of aquatic plants has been suggested as a method for slowing the "cultural eutrophication" of lakes. By removing harvested milfoil from the water, bound nutrients are taken out of the normal cycle and are, therefore, unavailable to fuel further aquatic plant or algal growth. Also, the biological oxygen demand, normally associated with aquatic plant decay, would be reduced due to the reduction of milfoil biomass in the water. Mechanical harvesting should cause no detectable adverse effects on water quality.

4.03.2 Rotovating. Rotovating would have a beneficial effect on water quality because of the removal of plant material from the water. These effects are detailed in the above discussion of mechanical harvesting.

Rotovating, however, could also cause serious short-term adverse impacts on the water quality due to the disruption of the substrate. The level of turbidity could be great, depending on the composition of the substrate. Suspended substrate particles would resettle on benthic organisms and aquatic vegetation. Suspension of bottom sediments could release significant quantities of nutrients and other bound chemicals to the water. The nutrients would be available to stimulate growth of aquatic plants and algae. Chemicals released from sediment suspension could have significant impacts depending on the chemical and concentration present in the sediment.

4.03.3 Suction Dredge. The suction dredge would have a beneficial effect on water quality in that it would remove plant material from the water. This benefit, as discussed above for mechanical harvesting, would be diminished in flowing water such as the Okanogan River because of higher levels of dissolved oxygen and the reaeration process.

The suction dredge would also have short-term adverse effects on water quality due to disruption of the substrate. An increase in turbidity would depend on the substrate composition, rate of water movement, and density of milfoil. This turbidity would have the same effects as presented for rotovating, although due to the small size of treatment areas, the adverse effects in water quality would be much less and usually not significant.

4.03.4 Hand Removal. Hand removal of milfoil would have a very slight beneficial impact on water quality due to plant material being removed from the water. It would also have a slight short-term adverse impact due to the disruption of the substrate.

4.03.5 Chemical Control (all alternatives). Adverse impacts to water quality are possible when chemical treatment is used to control milfoil. The milfoil would die and begin to decompose in a relatively short time, possibly creating a large short-term biological oxygen demand and a longer-term buildup of organic sediment. The decomposition of milfoil is estimated to require a 1 to 1 ratio of free oxygen to organic matter (Jewell, 1971). Since milfoil can produce over 10,000 pounds of biomass per acre, the decrease in dissolved oxygen could be very significant in some areas if proper treatment procedures are not used. Problems with decreased dissolved oxygen levels are not anticipated for the proposed treatments because of the narrow areas which provide adequate water exchange from untreated areas. Chemical control operations would have some drift into nontreatment areas. The drift would vary depending on current, rate of uptake by plants, and the chemical formulation used. The impacts to the drift areas would be the same as to the treatment areas if the concentration were high enough.

Milfoil contains significant amounts of bound nutrients. Nichols and Keeney (1973) have documented a rapid accumulation of organic and inorganic phosphorus in the water during the decomposition of milfoil. Since phosphorus is thought to be the most likely limiting factor for plant growth in many water bodies, a milfoil kill may result in a rapid growth of other aquatic plants or algae.

Water quality will change with the introduction of a herbicide to the water column. Effects on public health, the natural aquatic environment and the desirability of the water for any use are presented in paragraphs 4.04.5.1-4.04.5.5, 4.05.5.1-4.05.5.2, 4.06.5.1-4.06.5.2, 4.07.5, 4.08.2-4.08.3, 4.15 and appendix C.

The persistence of aquatic herbicides in the water column is dependent on metabolic breakdown by micro-organisms, extent of dilution, water depth, water temperature, etc. Generally, however, these chemicals would not remain in the water at detectable concentrations for very long. A longer retention period could occur in the sediments.

4.03.6 Fiberglass Bottom Screens. Since bottom screens would result in the decomposition of aquatic vegetation in the water, the adverse effects of biological oxygen demand and nutrient release discussed for chemical control would also apply. Because of the small area of treatment, however, the impact would be minor.

4.03.7 Aerial Surveillance. Aerial surveillance would have no effect on water quality.

4.03.8 Ground Surveillance. Ground surveillance would have no effect on water quality.

4.03.9 Fragment Barriers. The barriers would have a small beneficial effect on water quality because of the removal of plant fragments and other debris from the water.

4.03.10 Public Information. The public information program would have no adverse effect on water quality.

In general, a successful program to prevent the spread of milfoil would prevent deterioration of water quality caused by large amounts of milfoil decomposing in the water each year (the amount of biomass over and above the normal present in the water body).

4.04 Impacts on Vegetation.

4.04.1 Mechanical Harvesting. Mechanical harvesting would cut the milfoil somewhere above the substrate. The harvester is nonselective so any other aquatic vegetation present would be cut at the same level. Dense stands of milfoil tend to shade out other species so the harvesting may have a beneficial effect on species diversity. Nichols (1971) has shown that milfoil in Wisconsin characteristically has two growth peaks (in early June and early August) occurring progressively later in deeper water. He speculates that proper timing of a harvest may make it possible to preferentially select against milfoil and promote the more desirable species.

Because mechanical harvesting does not affect root structure, the aquatic plants would continue to grow and eventually would reattain their pre-harvest height. Several studies, however, have shown that intensive harvesting has a carry-over effect; that is, repeated harvesting eventually decreases the need for harvesting (Grinwald, 1968; Nichols and Cottam, 1972; and Wile, 1978).

4.04.2 Rotovating. Rotovating would remove th entire plant so the milfoil would not be able to grow back from the root crown. Rotovating is totally nonselective so any nontarget plant species in the treatment area would also be removed.

Milfoil could eventually reinfest the area if fragments float in from other milfoil colonies.

4.04.3 Suction Dredge. The suction dredge would also remove the entire plant so the milfoil would not be able to grow back from the root crown. In ideal circumstances (good diver visibility and low milfoil density), the suction dredge should be highly selective for milfoil, thus benefiting the nontarget species.

If the substrate is very soft, causing water turbidity to result from the dredging, thus obstructing the diver's vision, or if the milfoil is dense enough to hide other species, the suction dredge becomes less selective and nontarget species are removed. This adverse impact will vary depending on local conditions.

4.04.4 Hand Removal. Hand removal would be very selective, resulting in the removal of only milfoil. The entire plant would be removed so regrowth would not occur from the root crown. If hand removal is interpreted to include raking and other such methods, the selectivity would be lost and the roots would probably remain intact. In either case, the impact would be minor.

4.04.5 Chemical Control. The impacts addressed are the same for the treatment area as well as nontreatment areas which are subject to herbicide drift.

4.04.5.1 2,4-D. 2,4-D administered in concentrations necessary to eliminate *Myriophyllum spicatum* would also kill *M. excalbescens* and water stargrass (*Heteranthra dubia*), a minor aquatic plant species in Washington. Because 2,4-D is so selective, the treatment would benefit nontarget species by removing milfoil, which is in competition with native species.

Some agricultural and ornamental plants are very susceptible to 2,4-D. If irrigation intakes pump treated water onto these plants, unwanted plant kills could occur. Due to the low concentrations, however, damage probably would not be possible to any but the most sensitive species. Management techniques and public notification of treatment would minimize this potential problem.

2,4-D is a systemic herbicide; it is taken up by the roots or the foliage and translocated throughout the plant. For this reason, 2,4-D would kill the entire plant. Regrowth would be mainly from fragmentation of healthy populations from other areas.

4.04.5.2 Endothall. Endothall acid administered in concentrations necessary to eliminate milfoil will also kill a wide range of nontarget species. Bass weed (*Potamogeton amplifolius*), coontail, bushy pondweed (*Najas* spp.), curly-leaf pondweed, flat-stem pondweed (*P. zosteriformis*), floating-leaf pondweed (*P. natans*), horned pondweed (*Zannichellia* spp.), sago pondweed (*P. pectinatus*), water stargrass, and several other species of pondweed will be eliminated from the treatment area.

Some upland plant kills could occur if water treated with endothall is used for irrigation. The label instructions state that treated

water is not to be used for irrigation within 7 days of treatment. Due to the low concentrations, damage probably would not be possible to any but the most sensitive species. Management techniques and public notification of treatment would minimize this potential problem.

Endothall is a contact heribicide; it is not translocated throughout the plant. Therefore, the susceptible species would be killed down to the substrate but could regrow from the root system. Treated milfoil areas would probably be reinfested from regrowth from the root system.

4.04.5.3 Dichlobenil. Dichlobenil is a nonselective aquatic herbicide which would eliminate milfoil, elodea, naiads, coontail, a variety of pondweeds, and Chara.

Dichlobenil is very toxic to upland plant species also. Treated water must not be used for irrigation. Dichlobenil is a systemic herbicide and thus would result in some degree of root kill.

4.04.5.4 Diquat. Diquat is a nonselective aquatic herbicide which would eliminate milfoil plus bladderwort (Uticularia spp.), coontail, elodea, naiads and most species of pondweed.

Diquat is also very toxic to many upland species. It could damage lawns, ornamental plants or food crops. Treated water should not be used for irrigation within 10 days of treatment.

Diquat is a contact herbicide and thus is not translocated throughout the plant. The susceptible species would be killed down to the substrate but may regrow from the roots. Milfoil would probably reinfest treated areas by sending up new shoots from the root system.

4.04.6 Fiberglass Bottom Screens. Bottom screens would block sunlight to all aquatic plants beneath the screen, disrupting the photosynthetic processes necessary for growth. Eventually, all vegetation, target species and nontarget species, would be eliminated from the covered area. (Some species would show an initial growth surge and stem elongation but would eventually die.) No regrowth would occur until the screen is removed or silted over.

4.04.7 Aerial Surveillance. Aerial surveillance would have no effect on vegetation.

4.04.8 Ground Surveillance. Ground surveillance would have no effect on vegetation.

4.04.9 Fragment Barriers. Barrier structures would have no direct effect on vegetation but would limit the spread of species which reproduce by fragmentation.

4.04.10 Public Information. The public information program would have no direct effect on vegetation other than a contribution to the

reduction in spread of milfoil by fragment transport. One goal of the program would be to obtain public cooperation in the removal of weed fragments from boats and trailers leaving infested waters. This, hopefully, would prevent milfoil fragments from being introduced into uninfested waters when these boats are launched.

4.05 Impacts on Habitat.

4.05.1 Mechanical Harvesting. The removal of the upper portion of aquatic vegetation by mechanical harvester would eliminate habitat for a variety of aquatic microflora and fauna, aquatic invertebrates and shelter for small fish. The harvester would cut somewhere above the substrate so a certain amount of habitat would remain. The aquatic vegetation would regrow after harvesting.

4.05.2 Rotovating. Rotovating would remove all plants from the treatment area, eliminating habitat as noted for mechanical harvesting. The loss would be greater with rotovating because none of the plant would be left and regrowth would be much slower. The total benthic habitat in the treatment area would be disrupted by rotovating.

4.05.3 Suction Dredge. The suction dredge would remove entire plants so the elimination of aquatic microflora and fauna, aquatic invertebrate habitat, and small fish shelter would be long lasting. Small areas of benthic habitat would be totally disrupted by treatment. The suction dredge, however, would have some degree of selectivity, removing milfoil while leaving nontarget species. This, and the fact that the suction dredge would be used only for very small areas, would reduce the effects of habitat loss.

4.05.4 Hand Removal. Hand removal would have the same effects on habitat as identified for the suction dredge. Hand removal, however, would be feasible only for scattered plants on very small patches of milfoil. Because of the small scale of the treatment, the impact on the habitat would be very minor.

4.05.5 Chemical Control. (For treatment areas and nontreatment areas subject to herbicide drift.)

4.05.5.1 2,4-D. Treatment with 2,4-D would eliminate a very high percentage of the milfoil in the treatment area but would not affect most native species. A large part of the habitat provided by the aquatic vegetation would be lost if a majority of the aquatic vegetation were milfoil. If a large population of native species were present, the effect would not be so great.

4.05.5.2 Endothall, Dichlobenil, Diquat. These chemicals are nonselective herbicides. They will eliminate a wide range of aquatic plants from the treatment area. Almost total elimination of the habitats provided by aquatic vegetation would result from the use of these chemicals.

4.05.6 Fiberglass Bottom Screens. Bottom screens would eliminate all the benthic habitat and habitat provided by aquatic vegetation located under the screening. The elimination would be long lasting, but the area involved would be relatively small.

4.05.7 Aerial Surveillance. Aerial surveillance would have no effect on habitat.

4.05.8 Ground Surveilliance. Ground surveillance would have no effect on habitat.

4.05.10 Fragment Barriers. Barrier structures would have no effect on habitat.

4.05.11 Public Information. The public information program would have no effect on habitat.

4.06 Impacts on Fish and Other Aquatic Organisms.

4.06.1 Mechanical Harvester. Analysis of milfoil harvesting operations in Ontario has indicated that some small fish are trapped during harvesting and are removed from the water. A ratio of approximately 8 lb. of fish per acre harvested was found with yellow perch making up the majority. The overall effect on fisheries was not considered to be significant (Wile, 1978). The number of fish removed from the water would depend on the method of removal of the cut plants; if they remain in the water for any length of time, the direct loss of fish should be reduced.

Harvesting may benefit game fish by causing an "edge effect" through the weed beds, making it easier for them to feed. Harvesting does result in the loss of habitat for organisms lower in the food chain and this may eventually affect the fish population if the treated area is large. Mechanical harvesting should have no significant effect on plankton populations.

4.06.2 Rotovating. Rotovating would have the same effects on fish and other aquatic organisms as mechanical harvesting, except that the vegetation would be eliminated for a longer period of time because of the root removal. The degree of disturbance to benthic organisms would be greater and of longer duration.

4.06.3 Suction Dredge. The suction dredge should have no significant effect on fish. There would be a small loss in other aquatic organisms.

4.06.4 Hand Removal. Hand removal should have no effect on fish and other aquatic organisms.

4.06.5 Chemical Control.

4.06.5.1 2,4-D. The toxicity of 2,4-D to fish is dependent upon the chemical formulation and the species of fish. A summary of toxicity

data is included in appendix C. Most fish species appear to be tolerant of 2,4-D at the concentrations used for milfoil control. Salmonids, however, may be more susceptible. Scientific information concerning 2,4-D impacts to salmonids is not available, but some preliminary work (Meehan et. al., 1974) indicates that there may be a problem. The State Department of Fisheries is agreeable to 2,4-D treatments as long as they are not in salmon spawning or migration areas during times of salmon use.

2,4-D residue buildup in spawning areas should not be a problem. Residues persist in the sediment of some areas because of the high organic content. Salmon spawning areas are primarily gravel with good water movement through the gravel.

Large plant kills in embayments or small lakes which are shallow and have limited water exchange could cause a large drop in the dissolved oxygen concentration. It is possible to lower the dissolved oxygen concentration enough to cause a fish kill. This should not be a problem because of the nature of the proposed treatment areas and the fact that chemical treatment would be done during periods of low biomass whenever possible. There would be adequate water exchange from the surrounding area to provide dissolved oxygen.

The elimination of shelter and food organisms due to vegetation loss could reduce the number of small fish available in the water body and thus reduce the population of larger fish. This effect would be reduced by the selectivity of the herbicide action which would leave nontarget plant species unharmed. Plankton species are not expected to be directly impacted by 2,4-D application. There may be some stimulation of phytoplankton growth as a result of increased nutrients released into the water column from decomposing milfoil.

4.06.5.2 <u>Endothall, Dichlobenil, Diquat</u>. The toxicity of these chemicals to fish is dependent upon the chemical formulation and the species of fish. A summary of toxicity data is included in appendix C. No fish kills, due to the toxicity of the chemical, should result from the concentrations used to treat milfoil.

If large areas heavily infested with milfoil are treated, the drop in dissolved oxygen concentration could cause fish kills. This would be compounded in areas which are shallow and have limited water exchange. This should not be a problem with this program because of the small size of the areas proposed for treatment with these herbicides.

Smaller fish would be impacted by the elimination of food organisms supported by the aquatic vegetation and also by increased predation due to the loss of shelter of thick aquatic growth. Larger fish may show a temporary gain due to more readily available prey but may decline over time due to the impact to lower food chain organisms. Even though these herbicides would affect a wide range of aquatic plants, the total effect would not be significant because of the small size of the treatment areas.

4.06.6 Fiberglass Bottom Screens. Bottom screens would not directly affect fish, but would eliminate shelter and food organism habitat and thus would impact other aquatic organisms.

4.06.7 Aerial Surveillance. Aerial surveillance would have no effect on fish or other aquatic organisms.

4.06.8 Ground Surveillance. Ground surveillance would have no effect on fish or other aquatic organisms.

4.06.9 Fragment Barriers. Barrier structures would block the top 3 or 4 feet of water but should not interfere with fish passage.

4.06.10 Public Information. The public information program would have no effect on fish or other aquatic organisms.

4.07 Impacts on Wildlife.

4.07.1 Mechanical Harvester. Impacts to waterfowl usage of aquatic vegetation would be the only effect of mechanical harvesting to wildlife. The change in food species availability may result in a small change in waterfowl feeding, but the overall effect should be minimal.

4.07.2 Rotovating. Rotovating would have the same effects on wildlife as mechanical harvesters except that the vegetation would be eliminated for a longer period of time because of the root removal.

4.07.3 Suction Dredge. The suction dredge would have no large effect on wildlife. Some waterfowl feeding areas may be affected but the scope would be very small.

4.07.4 Hand Removal. Hand removal would have no impact on wildlife.

4.07.5 Chemical Control (all alternatives). Some wildlife species could come into contact with water chemically treated for milfoil control. The toxicity to wildlife is dependent upon the chemical formulation and the species. A summary of toxicity data is included in appendix C. No direct adverse effects should occur from the concentrations used to control milfoil. An indirect effect could occur due to the change in food species availability to waterfowl.

4.07.6 Fiberglass Bottom Screens. Bottom screens would have no effect on wildlife.

4.07.7 Aerial Surveillance. Aerial surveillance would have no effect on wildlife.

4.07.8 Ground Surveillance. Ground surveillance would have no effect on wildlife.

4.07.9 Fragment Barriers. Barrier structures would have no effect on wildlife.

4.07.10 Public Information. The public information program would have no effect on wildlife.

4.08 Impacts on Public Health.

4.08.1 General. The elimination or reduction of milfoil infestations would reduce mosquito breeding areas, in proportion to the percent of milfoil treated, and thus reduce mosquito populations. Mosquitoes are mainly a nuisance in western Washington but could possibly carry encephalitis in eastern Washington.

4.08.2 2,4-D. 2,4-D has been shown to be toxic to humans at high concentrations. Public concern has been expressed that 2,4-D could cause cancer, birth defects, mutations, or miscarriages by itself or in conjunction with other chemicals. Some studies do conclude that 2,4-D may have some adverse effects. Review of the scientific literature indicates that insufficient research has been done concerning carcinogenicity. The results of the few studies that have been done on rats are subject to criticism and differing interpretations. 2,4-D has not been conclusively shown to be carcinogenic.

There is no scientific evidence that 2,4-D would promote miscarriages but it has been shown, with prolonged exposure, to cause a decrease in fetal weight and other developmental problems in laboratory rats.

2,4-D has been shown to have a weak mutagenic effect on some tested organisms (fruit flies and hampster cells) but to have no effect on others (bacteria and yeast).

The adverse effects on test organisms shown to be caused by 2,4-D have resulted from prolonged exposure to high doses (compared to concentrations which would result from aquatic plant control). One study, however, indicates that the low concentrations of 2,4-D in combination with 2,4-dichlorophenol, a breakdown product, caused hemorrhaging in rat fetuses.

Existing evidence, although admittedly incomplete, seems to indicate that some threat to public health from exposure to 2,4-D resulting from its use in aquatic plant control does exist. For that reason, and the facts that the synergistic effects of 2,4-D with other naturally occurring or introduced chemicals have not been studied, and that 2,4-D could be ingested or absorbed through the skin of swimmers, public exposure should be limited to the extent possible.

A more detailed discussion of the available scientific literature regarding 2,4-D is presented in appendix C.

4.08.3 Endothall. Endothall has not been found to promote tumors or fetal abnormalities in rats but has been shown to increase mutations in fruit flies. Public exposure should be limited to the extent possible (see appendix C for more detailed information).

4.08.4 Dichlobenil. Testing on laboratory animals has not shown dichlobenil to be carcinogenic, teratogenic, or fetotoxic. The present testing, however, is not considered to be adequate. Public exposure should be limited as much as possible (see appendix C for more detailed information).

4.08.5 Diquat. Diquat has not been shown to promote tumors in rats; although, the literature indicates that inadequate testing has been done in the field of teratogenicity, fetotoxicity, and mutagenicity (diquat has been shown to increase DNA synthesis in human cell cultures). Public exposure should be limited to the extent possible (see appendix C for more detailed information).

4.09 Impact on Threatened and Endangered Species. According to the U.S. Fish and Wildlife Service list of Endangered and Threatened Wildlife and Plants (17 January 1979), there are nine species of endangered or threatened fish and wildlife which may be found in Washington. These are made up of four mammals, four birds, and one reptile. None of the control or prevention alternatives would have any effect on these species.

4.10 Impacts on Prime and Unique Farmland. None of the control or prevention alternatives should have any effect on prime or unique farmlands.

4.11 Impacts on Human Population. None of the control or prevention alternatives should have any effect on human population.

4.12 Impacts on Income and Employment. The Aquatic Plant Managememt Program could prevent the loss of income and employment in water related businesses such as marinas, shoreside motels, etc., due to heavy infestations of milfoil.

The program itself would provide employment to a limited number of people and increase the business of weed control contractors.

4.13 Impacts on Local Government. The Aquatic Plant Management Program would require 30 percent cost-share funding from the local government.

Local government participation is voluntary; if they do not believe the program would benefit their area, they are not required to participate.

4.14 Impacts on Property Values and Tax Revenues. Long-term, dense infestations of milfoil could eventually cause waterfront property to lose value and therefore cause tax revenues to decrease. The Aquatic Plant Management Program would prevent these adverse effects.

4.15 Impacts on Recreation. Water-related recreation is now being obstructed by milfoil infestations in some of the state's waters, and many other water bodies could be affected in the future. The Aquatic Plant Management Program could open up infested areas to recreational use and prevent other recreational areas from being obstructed.

Herbicide treatment of milfoil beds could restrict recreational use for short periods of time after treatment. Endothall treatment restricts swimming for 24 hours and fishing for 3 days. Dichlobenil restricts fishing for 90 days.

4.16 Impacts on Navigation.

4.16.1 Control Program. The control methods would have a beneficial impact on navigation, especially for recreational boating. The control program would remove obstructions to boating caused by milfoil in shallow water. The control program would have no adverse impacts on navigation.

4.16.2 Prevention Program. None of the prevention methods would have any impact on navigation except for barrier structures. The proposed barrier structure across the Okanogan River would prevent small boat passage from the barrier to Zosel Dam, a distance of approximately 1/2 mile.

A barrier structure was maintained during the summers of 1977 and 1978 by the Washington Department of Ecology. The new structure will not increase the impacts to navigation.

4.17 Impacts on Community Cohesion. Controversy already exists over treatment methods for the control of milfoil in the State of Washington. Many property owners want immediate treatment with chemicals because they feel that chemical control is the most effective and the least expensive treatment available.

Another group is opposed to any chemical treatment for milfoil in the state because of environmental and public health considerations.

The Aquatic Plant Management Program may cause increased friction between these opposing groups.

4.18 Impacts on Public Services and Facilities. Some water-related public recreation facilities have already been obstructed by milfoil infestations. Many more could be affected in the future.

The Aquatic Plant Management Program could reestablish full use of these public areas and prevent problems at those not currently affected.

4.19 Impacts on Business and Industry. Water-related businesses would benefit by the control of milfoil. The program could benefit commercial interests depending on which methods were used. Chemical manufacturers and retailers, builders of mechanical harvesting equipment, and weed control companies are some that could benefit.

4.20 Impacts on Historical and Archeological Resources. The Aquatic Plant Management Program should have no effect on historical or archeological resources unless rotovating must be used. The disruption of the substrate could adversely affect historical sites.

5. PROBABLE ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED SHOULD THE PROPOSAL BE IMPLEMENTED

5.01 Mechanical Harvesting. Minor adverse impacts to air quality would result from exhaust emissions from mechanical harvesters and trucks used to haul harvested milfoil to disposal sites. The mechanical harvesters and trucks would also increase the local noise levels during operation. The trucking operation would result in a small increase in traffic through residential areas.

Mechanical harvesting is completely nonselective. Nontarget vegetation would be cut in the treatment area. It would eliminate habitat for a variety of aquatic microflora and fauna, aquatic invertebrates, and shelter for small fish. Also, a small number of fish would be lost due to entanglement with the milfoil during removal.

5.02 Rotovating. The minor adverse impacts to air quality, noise, and traffic would be the same as for mechanical harvesting. The major adverse impacts caused by rotovating would be due to the total disruption of the substrate. The entire benthic community would be exposed to predation, displaced, or destroyed; the turbidity would be greatly increased; and nutrients trapped in the substrate would be reintroduced to the water column and available to fuel aquatic plant or algae growth. Suspended particulate matter may build up on beaches in soft bottom areas.

Rotovating is totally nonselective; almost every aquatic plant would be removed from the treatment area. Habitat for a variety of aquatic organisms would be lost.

5.03 Suction Dredge. The suction dredge would have very minor impacts on air quality and noise, much the same as mechanical harvesting.

The suction dredge would increase the turbidity of the water, cause remixing of nutrients into the water, remove some nontarget plant species, and eliminate habitat for some aquatic organisms. The magnitude of those impacts would depend on local conditions.

5.04 Hand Removal. Hand removal could result in a slight increase in turbidity and a small loss of habitat for aquatic organisms.

5.05 Chemical Control. Milfoil treated with an aquatic herbicide, or subject to herbicide drift, would begin to die in a short time. A large amount of dissolved oxygen would be taken out of the water by the biological decomposition of dead milfoil. The drop in dissolved oxygen, especially in warm, shallow water, could result in fish mortality.

Nutrients bound by the milfoil would be released into the water during decomposition. The increased nutrient levels may cause an algal bloom or a rapid increase in the growth of other aquatic plants.

Aquatic herbicides, which are foreign to the aquatic system, will remain in the water and sediments for varying periods of time depending on physical water quality parameters and the chemical used. Some public recreation activities would be temporarily restricted.

Large amounts of habitat for a variety of aquatic organisms and shelter for small fish would be lost due to chemical treatment. This impact would be greater for endothall, dichlobenil, and diquat because they are nonselective and would kill a wide variety of aquatic plants.

Any of the chemical alternatives could cause potential damage to upland plant species if treated water were used for irrigation not in accordance with label instructions.

Use of the 2,4-D alternative in control of milfoil presents a potential human health impact. EPA has stated that the continued use of 2,4-D is not imminently hazardous to the environment and the chemical is registered for use in aquatic plant control. Because the evidence regarding its public health impacts is not conclusive, care should be taken to limit human exposure.

5.06 Fiberglass Bottom Screens. Bottom screens would result in the decomposition of plant material in the water. The decomposition would cause a decrease in the dissolved oxygen level.

Milfoil and nontarget aquatic plant species would be killed by bottom shading, eliminating habitat for aquatic organisms and shelter for small fish. The benthic organisms would be made unavailable to the food chain.

5.07 Aerial Surveillance. Aerial surveillance would have no unavoidable adverse environmental impacts.

5.08 Ground Surveillance. Ground surveillance would have no unavoidable adverse environmental impacts other than a minor increase in exhaust emissions and traffic.

5.09 Fragment Barriers. Some temporary noise level increases and exhaust emissions would result during initial installation and maintenance. An adverse impact on esthetics and navigation would result from a barrier spanning the waterway. The impact to esthetics would be increased by the accumulation of debris behind the barrier.

5.10 Public Information. The public information program would have no unavoidable adverse environmental impacts.

6. ALTERNATIVES TO THE PROPOSED ACTION

6.01 Alternative Treatment Methods. The following control methods, used in other parts of the United States and in Canada, were evaluated for possible inclusion in the Washington State program.

6.01.1 Dredging. A "Mud-Cat" hydraulic dredge has been used in British Columbia for milfoil control. Sediment and plant roots are loosened by a transverse rotating auger and transferred to a diked spoil area by suction pumps. The dredge pumped between 125 and 155 cubic yards of silt per hour from depths up to 18 feet.

The "Mud-Cat" treated 0.25 to 0.5 acres per day at a cost of $2,000 per acre (1975 costs). The treatment was approximately 90 percent effective in removing rooted plants.

The use of the "Mud-Cat" was discontinued in British Columbia because of the adverse environmental impacts of removing such large quantities of sediment, the problem of obtaining disposal sites, and the high cost of treatment.

Dredging is not considered to be an environmentally acceptable method for treating milfoil in Washington.

6.01.2 Hydraulic Washing. This method of treatment was also tested for milfoil control in British Columbia. High-pressure water jets were used to dislodge weed roots from the sediment. The weeds were collected when they floated to the surface and were removed from the water.

Hydraulic washing was not successful in removing well-established root systems, but was used in conjunction with a rotovator washing sediment from roots and dislodging fragments so they would float and could be collected. The washer resulted in removal of 50 percent of the biomass remaining after rotovating.

Treatment with a hydraulic washer would cost close to $120 per acre and would cover only 2 acres per day. Hydraulic washing would cause additional turbidity and disruption of the benthic community. The results of this treatment do not warrant the cost or the resulting environmental impacts.

6.01.3 Simazine. Simazine (2-chloro-4,6-bis(ethylamino)-striazine) is an aquatic herbicide which would kill milfoil and many other aquatic plants including pondweeds and naiads. It is also toxic to a wide range of terrestrial species.

Simazine is not well suited to the Aquatic Plant Management Program because treatment of the entire water body is required. It cannot be used for spot treatments.

6.01.4 Silvex. Several herbicides registered for aquatic use in Washington State have silvex (2-(2,4,5-trichlorophenoxy) propionic acid) as the active ingredient. It would kill milfoil, fanwort (*Cabomba caroliniana*), bladderwort, and other water plants at the concentration recommended by the label instructions. Silvex would also damage a variety of terrestrial species including some agricultural crops.

Silvex is somewhat more persistent in the aquatic environment than 2,4-D and is more phytotoxic to some aquatic plants. Silvex is used in aquatic environments mainly as a substitute for 2,4-D when treating resistant species.

The use of silvex is presently banned by EPA and is not proposed in the Aquatic Plant Management Program.

6.01.5 Fenac. Fenac (2,3,6-trichlorophenylacetic acid) has been approved for use as an aquatic herbicide in Washington State. It would kill milfoil plus several species of pondweed, elodea, southern naiads, water stargrass, coontail, and slender spikerush (*Eleocharis acicularis*).

Fenac would also kill a variety of terrestrial species including agricultural crops. Care must be taken to insure that treated water is not used for irrigation.

Fenac is not well suited for use against milfoil in Washington because treatment must take place after the waterbody has been drained or drawn down. Treated areas must remain dry for 3 weeks following treatment.

6.01.6 Endothall Acid (dimethylamine salt). Dimethylamine salt of endothall is approved for aquatic use in Washington State. It would kill several species of algae and a wide range of submerged aquatic macrophytes. Besides milfoil, it would kill naiads, elodea, coontail, pondweeds, tapegrass, and *Cladaphora* spp. Damage to terrestrial species, including agricultural crops, could result if treated water were used for irrigation.

Dimethylamine salt of endothall is not recommended for use against milfoil in Washington because of its high toxicity to fish. This formulation of endothall will cause fish kills at concentrations of 0.3 parts per million, less than the required concentration to kill milfoil.

6.01.7 Water Level Fluctuation. Water level fluctuation has been found to be an effective method of milfoil control in Tennessee Valley Authority reservoirs. Dewatering of milfoil for 3 weeks gives complete control if there is adequate drainage (Smith, 1963). Shorter periods of dewatering, even without extended periods of low water, result in significant reduction of milfoil populations (Goldsby and Bates, 1978).

Water level fluctuation would result in the elimination of nontarget aquatic macrophyte species and could also cause erosion and bank sloughing problems. Fluctuations would be dependent upon conflicting uses of the water body.

Water level fluctuation is not a feasible alternative for the areas being recommended for immediate treatment because of lack of drawdown capabilities. However, this control method should be considered for use if treatment becomes necessary in reservoirs or other water bodies with drawdown capabilities.

6.01.8 Sand or Gravel Blankets. Sand and gravel blankets have been used for aquatic plant control in Wisconsin. The treatment is immediately effective, but eventually silt builds up and aquatic plants reestablish themselves.

The placement of sand or gravel would eliminate all aquatic macrophyte species and would also destroy the benthic community. Both would reestablish with time.

This treatment method would be justified only for high-use public recreation areas in which the elimination of all plant species is acceptable. The placement of sand or gravel blankets for the control of milfoil in Washington State is not recommended because less disruptive methods are available.

6.01.9 Bottom Barriers. Two types of bottom barriers have been tested in British Columbia: a 4-6 mil polyethylene and a 30 mil "Hypalon" with nylon reinforcement.

These barriers are installed and anchored to the bottom in the spring and prevent sunlight from reaching the aquatic plants. Both barriers have proved to be almost 100 percent effective in eliminating aquatic plants from the treatment area, but each has serious drawbacks: high capital cost ($4,000 and $16,000 per acre, respectively), time consuming installation, storm and wave damage, lifting caused by gas bubbles, and accumulation of silt on the barriers.

The use of bottom barriers is not proposed for use in the Aquatic Plant Management Program.

6.01.10 Biological Controls. At present, there are no biological control methods which could be used to treat milfoil in Washington State. However, research is being done on several possible biological agents.

The white amur (Asian grass carp, *Ctenopharyngodan idella* Val.) has shown promise as a control agent. It consumes large amounts of aquatic vegetation but also has disadvantages. It is nonselective and, because of its very short digestive tract, large amounts of incompletely digested plant material are returned to the water. The nutrients contained in this material are added to the water column

and are often sufficient to fuel an algal bloom. (Prowse, 1969; Stanley, 1974)

The white amur must be completely tested for possible effects on game fish populations, aquatic animals, aquatic microorganisms and native aquatic plants before any importation is proposed.

Research projects in Yugoslavia and Pakistan have identified 25 insect species feeding on milfoil (Spencer and Lekic, 1974). Some of these species show promise as biological control agents but must first be tested and approved for importation by the U.S. Department of Agriculture.

In the future, biological control may be the most economical and the least disruptive method to deal with milfoil. For the present, however, no biological control agents are available for use against milfoil in Washington State.

6.02 <u>Alternative Scopes of Treatment.</u>

6.02.1 <u>Control Program.</u>

6.02.1.1 <u>Treatment of all Known Milfoil Colonies (Eradication).</u> Some milfoil colonies, because of density, depth, location, or other factors, do not cause obstructions to navigation or recreational use of state waters. The only reason that these areas would be treated would be as part of an eradication program in which all sources of reinfestation by fragmentation would have to be eliminated.

An eradication program would involve treatment of a majority of the shallow water areas of Lakes Washington, Union, and Sammamish and the Sammamish River, plus all nonnavigable waters which have milfoil colonies.

Because of the necessity to eliminate the milfoil root structure, an attempted eradication program would have to utilize large amounts of the herbicide 2,4-D or dichlobenil. Limited use could be made of diver-operated suction dredges, hand pulling, and rotovators.

Problems which would be associated with a milfoil eradication effort are: (1) there is public opposition to the extensive use of chemicals in state waters; (2) because of th[illegible] distribution of milfoil, an eradication effort would be ver[illegible]ly and, based on previous national experience, may be imp[illegible]le to achieve; (3) milfoil colonies in Canada would be providing a continuous source of fragments to Washington waters; and (4) major milfoil infestations which now cover large areas of Bureau of Reclamation reservoirs in eastern Washington would have to be treated concurrently but independently of any aquatic plant management program cost-shared by the Corps of Engineers.

Because of these problems, a milfoil eradication program is not considered to be a viable alternative for the Aquatic Plant Management Program.

6.02.1.2 Treatment of Selected Areas. The preferred plan for the control portion of the program is the treatment of selected high-use public areas. These areas include waterfront parks, swimming beaches, boat launch ramps, and general boating areas. This alternative eliminates obstructions to the most severly impacted areas and does not cause excessive environmental disruption.

6.02.1.3 No Action. Without milfoil control, public swimming beaches and other recreation areas could become obstructed and recreational use would decline. The amount of recreational loss would be dependent upon the milfoil density, which would vary from year to year.

Without a comprehensive Federal control program, milfoil treatment would fall to local governments, park departments, private property owners, and other interests. Public recreation areas would be treated under normal operation and maintenance funding if available. Increased maintenance costs caused by milfoil growth could, however, result in cut-backs to other types of maintenance or a reduction in available recreation.

Private property frontage could be treated by a commercial weed control company, funded by a Weed Improvement District or an informal alliance of property owners. This type of treatment was funded by a group of property owners on Lake Washington in the summer of 1979.

The possibility also exists that some property owners would treat their own waterfront without state permits. This could lead to the use of unauthorized and damaging chemicals or the misuse of approved chemicals.

6.02.2 Prevention Program.

6.02.2.1 Surveillance and Treatment of All Waters in the State. This would be an effort to discover and eradicate new milfoil colonies wherever they occurred in the state, regardless of their possible threat to navigable waters. Such an effort would require extensive control and eradication efforts upon all existing milfoil infestations, since milfoil is spread by the carrying of fragments from one area to another. This is not a cost-effective approach, nor would it be environmentally acceptable.

6.02.2.2 Surveillance and Treatment of High Risk Areas. This alternative would concentrate efforts upon those navigable waters having the highest probability of becoming infested because of proximity to existing infestation, and upon nonnavigable waters where small existing infestations may spread to navigable waters.

6.02.2.3 No Action. The no action alternative could result in the continued spread of milfoil throughout the state. In time, most of the reservoirs on the Columbia River could have heavy infestations which would greatly interfere with the use of these reservoirs. Irrigated areas of the state, notably the Yakima Valley and the Columbia Basin, could be heavily impacted by the interference to waterflow from the presence of milfoil in irrigation systems.

Isolated water bodies could be infested due to recreational traffic among lakes and reservoirs.

The uncontrolled spread of milfoil allowed by the no action alternative would be unacceptable for the goals of the Aquatic Plant Management Program.

7. RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

7.01 Control Program.

7.01.1 Mechanical Control. Harvesting, rotovating, suction dredging, and hand removal would have temporary and minor adverse impacts to air and water quality, and a substantial impact to aquatic vegetation and associated habitat. There would also be temporary and minor impacts to the terrestrial environment due to upland disposal of harvested plants.

These control measures would provide for immediate use of the water and would not affect the long-term productivity of the aquatic system.

7.01.2 Chemical Control. Chemical control of milfoil would have longer lasting impacts on water quality due to decomposition of plant material and the persistence of chemicals in the water.

Chemical control would provide for short-term local use of the waters. Continued annual treatment over an extended time period could possibly impact the long-term productivity of the water body if chemical residues began to accumulate in the sediments.

7.01.3 Fiberglass Bottom Screens. Bottom shading would provide for immediate use of the water and would give longer control than mechanical or chemical treatment. The impacts would be minor and readily reversible. There would be no impact to the long-term productivity of the water body.

7.02 Prevention Program. The prevention program, if successful, would preserve the species diversity of waters presently uninfested by milfoil. It would not affect the long-term productivity of any water body.

8. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES WHICH COULD BE INVOLVED IF THE PROPOSED ACTION SHOULD BE IMPLEMENTED

8.01 Control Program.

8.01.1 Mechanical Control. Harvesting, rotovating, and suction dredging would involve the commitment of fuel and manpower for treatment, transport, and disposal of milfoil. A commitment of a large amount of capital investment would also be involved. Hand-pulling would primarily consist of a commitment of manpower.

8.01.2 Chemical Control. Chemical control would involve the commitment of the chemicals to be used, the fuel and manpower necessary for manufacture of the herbicides, and dispersal over the treatment area.

8.01.3 Environmental Manipulation. Bottom shading would involve the commitment of the fiberglass screening plus the minor amounts of fuel required for installation. A minor amount of labor will be committed during installation and a larger amount for periodic maintenance.

8.02 Prevention Program. The prevention program would be highly labor intensive. Keeping the public informed and training state, local, and Federal agency personnel to perform the ground surveillance would be an ongoing effort and would be time consuming. Maintenance and cleaning of the barriers would be required several times a week. The installation of the barriers would also involve a commitment of labor and materials.

The aerial and ground surveillance would involve a commitment of large amounts of fuel, but this could be lessened by the incorporation of the surveillance into ongoing activities wherever possible.

9. COORDINATION

9.01 Public Participation. The aquatic plant management study was initiated after the Washington State Department of Ecology requested assistance in establishing a milfoil prevention and control program in Washington State.

Public workshops were held on 12 July 1977 and 30 January 1979 in Seattle and on 14 July 1977 and 25 January 1979 in Oroville to obtain public input into problem areas, treatment suggestions, and specific concerns. A public information pamphlet was widely distributed in January 1979 and also requested public input.

The final public meetings were held on 4 and 6 September 1979 in Seattle and Okanogan, Washington, respectively, to present the proposed Aquatic Plant Management Program. Public concern was expressed regarding the chemical treatment methods and about the possible spread of milfoil in the waters of the state.

9.02 Cultural Resources Coordination. In compliance with Section 106 of the National Historic Preservation Act of 1966 and Executive Order 11593, coordination regarding project impact on cultural resources has been maintained with the appropriate Washington State and Federal agencies. Pertinent correspondence is contained in appendixes D and E.

9.03 Prime and Unique Farmlands. Contact has been made with the U.S. Department of Agriculture concerning any project impacts on prime and unique farmlands. Refer to appendix D for relevant correspondence.

9.04 Land Use Plans. The proposed project has been reviewed with respect to local, state, and Federal land use plans and regulations. Applicable local, state, and Federal permits would be obtained by the local sponsor prior to the work.

9.05 Mineral Resources. The proposed project has been reviewed by the U.S. Bureau of Mines with respect to possible project impacts on mineral resources. Refer to appendix D for relevant correspondence.

9.06 Sole-Source Aquifer. Contact has been made with the U.S. Environmental Protection Agency concerning any project impact on the Spokane Valley - Rathdrum Prairie Aquifer (designated as sole-source). Refer to appendix D for relevant correspondence.

9.07 Registered Aquatic Herbicides. Contact has been made with the Washington State Department of Agriculture and the U.S. Environmental Protection Agency concerning aquatic herbicides registered for use in the State of Washington. Refer to appendix D for relevant correspondence.

9.08 Fish and Wildlife Coordination. In accordance with Section 2(a) of the Fish and Wildlife Coordination Act of 1958, detailed

coordination with resource management agencies has been carried out since the initiation of this study. This coordination aided plan formulation, preparation of the Fish and Wildlife Coordination Act Report (by the U.S. Fish and Wildlife Service), and this impact statement.

The following agencies were contacted concerning project impacts to fish and wildlife resources, including any threatened and endangered species: U.S. Fish and Wildlife Service, National Marine Fisheries Service, Washington State Department of Game, and Washington State Department of Fisheries. Their comments and suggestions have been incorporated into the project plan. Refer to appendixes D and E for relevant correspondence.

9.09 Coordination of the Draft Environmental Impact Statement. The draft environmental impact statement (EIS) for the State of Washington Aquatic Plant Management Program was listed in the Federal Register on 27 July 1979. At public request, the comment period was extended to 14 September 1979.

Forty-one letters, containing 107 pages of comments and 34 pages of exhibits, on the draft EIS (see appendix E) were received from the following individuals, groups, and agencies.

Number	Source	Date
1	Debbie Powell	Undated
2	U. S. Department of Interior	23 Jul 79
3	Okanogan County	23 Jul 79
4	Washington State Parks and Recreation Commission	25 Jul 79
5	Mike McPhail	27 Jul 79
6	Municipality of Metropolitan Seattle (METRO)	3 Aug 79
7	Advisory Council on Historic Preservation	6 Aug 79
8	City of Kirkland	9 Aug 79
9	Gil Zemansky	10 Aug 79
10	U. S. Department of Housing and Urban Development	15 Aug 79
11	Pennwalt Corporation	20 Aug 79
12	Mike McPhail	20 Aug 79
13	City of Bellevue	23 Aug 79
14	U. S. Department of Health, Education and Welfare	27 Aug 79
15	Aquatic Control	28 Aug 79
16	Washington State Office of Archeological and Historic Preservation	28 Aug 79
17	Howard Millan	29 Aug 79
18	City of Seattle	29 Aug 79
19	Robert Dahl	30 Aug 79
20	U. S. Environmental Protection Agency	30 Aug 79

Number	Source	Date
21	Washington State Department of Ecology	31 Aug 79
22	Washington State Department of Ecology	31 Aug 79
23	Washington State Department of Fisheries	20 Aug 79
24	Washington State Department of Game	23 Aug 79
25	Washington State Department of Natural Resources	20 Aug 79
26	Washington State Department of Transportation	21 Aug 79
27	Greenpeace - Seattle	Undated
28	Walbridge Powell	3 Sep 79
29	Seattle Audubon Society	13 Sep 79
30	Sierra Club - Cascade Chapter	5 Sep 79
31	Washington State Department of Game	11 Sep 79
32	Washington Environmental Council (Seattle)	13 Sep 79
33	Washington Environmental Council (Grant County Chapter)	13 Sep 79
34	Mr. and Mrs. William Favro	14 Sep 79
35	Friends of the Earth	14 Sep 79
36	U. S. Department of Interior	17 Sep 79
37	Yakima County Audubon Society	15 Sep 79
38	King County	20 Sep 79
39	Friends of the Earth	25 Oct 79
40	METRO	25 Oct 79
41	Seattle Audubon Society	26 Oct 79
42	Citizens Against Toxic Herbicides	Undated

Due to the number of comments which were duplicative, the comments were grouped into eight categories for response: (1) Coordination with METRO, (2) Need for a Management Program, (3) Treatment Areas, (4) Treatment Methods, (5) Use of Chemicals, (6) Economic Analysis, (7) Design Memorandum, and (8) Comments not Categorized. Our response to each comment within the eight categories is presented in the following paragraphs. The number in parentheses following each comment corresponds to the comment letter number shown above.

9.09.1 Comment-Response Category 1 - Coordination with Municipality of Metropolitan Seattle (METRO).

Comments: Page 47 - Other than a cursory note of its existence, the draft EIS fails to present any relevant information with regard to aquatic plant control studies being carried out by Metro in coordination with other agencies. Such information is critically relevant to the proposed program and should not be ignored. Why hasn't the Corps coordinated directly with METRO? As a member of the METRO Technical Committee advising METRO with regard to the conduct of their study, the absence of interest by the Corps has been striking. (9)

Not only do nonchemical alternatives exist, they are being developed locally. Although the METRO Milfoil Demonstration Project is mentioned in the draft EIS, there appears to be no coordination with or capitalization on it. (29)

Page 66 - METRO and the city of Seattle have done a considerable amount of work researching bottom screens in the field. Information which they have generated and will generate in the near future should be included herein. It is not even mentioned. (9)

We are concerned that the Corps will finalize this EIS before the results of the METRO sponsored Union Bay research project are completed. The METRO project could provide some relevant data for choosing the best combination of control methods. It will also add some current cost-benefit data. We thereby urge that the final EIS should incorporate the results of the METRO study. (18)

The final EIS should contain up-to-date information on both the Metro study and the State Department of Ecology 1979 control program, and indicate how any new information will be incorporated into the Corps of Engineers' program. (20)

We do not see how the Army Corps can justify the rapidity with which this process has been moving forward, and indeed the writing of this draft EIS at all now when Seattle METRO has not yet completed their 2-year research project on milfoil biology and control. The knowledge METRO is producing will likely be invaluable to any statewide look at the milfoil question. It seems to us at least premature, and perhaps rash for the Army Corps to be proposing milfoil control before METRO's study is completed. We must reiterate that we need to know the cause of milfoil growth in the Northwest before we try to limit that growth, and METRO's study may provide some useful insights into that question. (30)

Page 1-5 (of the design memorandum) - METRO. Mention is made of METRO's "demonstration project". Absolutely no mention is made of how the information generated during that study (most of which is still not available even in draft form) will be utilized to influence the "control" program. Mention of this aspect of the situation was made in several places in Mr. Zemansky's comments of 10 August 1979. Since METRO is the likely "local sponsor" of any such "control" program in the Seattle area, as the appropriate governmental agency, this failure in coordination is difficult to understand. Your agency has known for at least the last year and one-half that METRO's "demonstration project" would not yield final results and a decision until December 1979; however, your process is taking place in advance of that time. (39)

Response: To be timely in response to the need to control/prevent milfoil growth, the Corps planned an Aquatic Plant Management Program for the State of Washington. During the course of the Corps study, coordination was maintained among the Corps of Engineers, the project manager for the METRO Demonstration Project, and the University of

Washington staff working with METRO. The METRO study has been valuable in providing information on alternatives in Lakes Washington, Sammamish, and Union. The inclusion of bottom screens in the proposed program was a result of the coordination. Mechanical harvesting, the other treatment method being tested by METRO, is one of the recommended alternative treatment measures in the Corps program.

The final EIS has been updated to include the latest information available from the METRO study and details of the Department of Ecology program. The decision on treatment methods used in the program would be made by the WDE and the local governments participating in the program. The Corps of Engineers program would be reviewed annually, and an annual supplement to the design memorandum and the environmental impact statement would be prepared. Advancements in aquatic plant management state-of-the-art from METRO, the Corps of Engineers' Waterways Experiment Station, and any other source would be assessed for inclusion in the program. State and local government input to the annual supplement would be necessary to accurately reflect current conditions. Any changes to the program would be incorporated in the annual supplement.

9.09.2 Comment-Response Category 2 - Need for a Management Program.

Comments: We are greatly concerned about the spread of milfoil in the Okanogan River system for many reasons, and feel that a program of this type is a necessity; however, Okanogan County, acting on its own volition, does not have the resources due to the scope of the existing problem and the potential impacts of the problem expanding. (3)

Control of milfoil in recreation areas will be extremely beneficial, particularly for swimming, boat launching, and water skiing. Heavy milfoil infestations can curb or eliminate these types of aquatic recreation pursuits. The short-time restriction on recreation use required for herbicide treatment of milfoil presents no problem for State Parks management, since the alternative of no treatment may well result in a permanent restriction on recreational use. State Parks has been in the past, and is again, willing to state that heavy infestations of watermilfoil will necessitate closing recreation facilities such as swimming beaches, boat launch ramps, and water ski areas. For example, the swim area at Steamboat Rock State Park (Bank Lake) was opened only after proper milfoil removal was effected in the spring of 1979. Since milfoil is now in the "explosive growth" state (page 6 of subject EIS), now is the time to effect control while the infestation is still small. If growth is allowed to continue unchecked, the areas to be treated will be much larger, as will the magnitude of the recreation losses. (4)

The concept of, and need for, such a management program was identified by METRO and DOE in 1977. (6)

The city of Kirkland is experiencing difficulties with milfoil infestation in heavily used swimming beach areas, specifically at Houghton Beach and Waverly Park. We request your consideration for inclusion of the former in the Yarrow Bay treatment proposal. (8)

Further infestation of milfoil could have a detrimental effect in Kirkland on recreational and navigational usages as well as causing a significant loss in value of adjacent shoreland and upland values. We endorse your efforts to solve the problem. (8)

We concur with the need for control measures; however, the method to be employed is not within our expertise. Thus, we have no constructive comments to offer. (10)

The Department of Fisheries recognizes a need to control milfoil in certain areas of the state, but at the same time, must be reasonably assured that chosen control meaures do not impact food-fish resources. (23)

Eurasian milfoil is unsightly, presents a potential hazard to swimmers, and may interfere with water skiing. (23)

Containment of spread to uninfested waters should be prosecuted at the highest levels possible under the two approaches. The potential for economic and environmental losses to Washington State and the Pacific Northwest from spread of this exotic plant are immense. (36)

There are at least two other kinds of sites in which heavy milfoil infestations will have adverse effects. Constructed drains which carry surface waste water and flows from buried pipe drains in farmland must be kept clear of obstructing vegetation. Otherwise, there is no sufficient capacity in them and the heightened water surfaces may prevent proper functioning of the tile drains. Lands which have been developed and drained at substantial costs may be lost from production. Eurasian watermilfoil may successfully overwinter in drains that have constant flows. (36)

Should watermilfoil spread to many of the small impoundments on the Columbia Basin Project, it could have adverse effects on recreational and fishery uses. Also, where irrigation pumping plants are located on such perennial water bodies, the vegetation debris produced from heavy stands could impact operation and maintenance of the facilities. (36)

Page 4-14 (of the design memorandum) - Proposed plan for Seward, Madrona, Pritchard, and Lake Sammamish beaches. In the case of the city of Seattle beaches no information has been presented to indicate that milfoil in fact grows at any of them or, if it does, how much of a problem it might be. Similarly, with regard to Lake Sammamish, the available information would not indicate that the small amount of milfoil in the vicinity of the beaches and boat ramp is a problem

(further discussion of this point is presented in Mr. Zemansky's letter of 10 August 1979 with regard to pages 16-28 of the draft EIS, comment number 20). (39)

Pages 2 and 6 - In the discussion of the introduction of nonnative species, it is indicated that " . . . The period of absorption . . . may take hundreds of years." No mention is made of the apparent rise, peak, and decline cycle that has occurred in other parts of the United States and Canada in significantly less than 10 years, or the evidence of decline in the Seattle area documented in Municipality of Metropolitan Seattle (METRO) reports. Furthermore, no mention is made of the potential for spread (either in this section or following sections) that would allow evaluation quantitatively for the Seattle area. If the potential is low, as it may be, and if a natural eco-librium has already been reached (assuming nonnative introduction), as it may be, is any control program intervention necessary? Is Eurasian watermilfoil, in fact, present at them (or all other sites listed in the draft EIS)? Surveys conducted in the winter and spring of 1979 failed to detect the presence of that plant, although water lilies were noted to be present at Seward. Similarly for Lake Sammamish, a survey in the spring of 1979 failed to find any problem resulting from the presence of Eurasian watermilfoil. Growths of that plant were not obstructing either swimming or boat ramp areas. In fact, the near absence of the presence of Eurasian watermilfoil, despite earlier assertions to the contrary by the state agency in charge of the park, forced METRO to relocate its planned mechanical harvesting demonstration effort from that area to another. (9)

Page 68 - In the limited and perfunctory discussion of the no-action alternative, the draft EIS indicates that things will get worse than they already are in the Seattle area. This is not quantified in any way (i.e., where is the suitable substrate for expansion in the Seattle area and how much is there?), doesn't deal with the question of natural "absorption" and cycles, and seems to ignore the data generated by METRO plant surveys over the last 3 years that, on the whole, there is not an increase occurring. (9)

The draft EIS fails to address the disagreement over whether or not a milfoil control program should be pursued. The appendix of the draft EIS contains a letter from Mr. Charles Chambers of the Fish and Wild-life Service which states (on page B-18) that " . . . There is a wide difference of professional opinion on the need to control milfoil." Since the time of Mr. Chambers' letter, the Corps' Waterways Experi-ment Station has further progressed with, if not completed, its pro-jections of potential milfoil infestation areas (see page 11). Of necessity, this study relied on certain assumptions. Any doubts as to the necessity and desirability of milfoil control should be dis-cussed in the EIS. (13)

On page 11 (1.03.6), more specific information on potential spread of milfoil would be helpful. (20)

We are not convinced that the number and extent of the areas where milfoil is growing in Washington State is increasing at all. Some areas in the United States and Canada, where milfoil growth has increased, have seen that growth peak and then decline. Seattle METRO's surveys of aquatic plants in the King County area show evidence that milfoil growth has stabilized. We, therefore, do not understand the urgency with which the Army Corps of Engineers seems to be pursuing milfoil control. (30)

The draft EIS does not adequately evaluate the tradeoffs involved as to whether the plant in question, milfoil, should be "managed" at all. There is very little detail provided on just how bad the milfoil "problem" is and, on the other side of the question, how important are the benefits of milfoil growth. Some boaters may feel milfoil interferes with their recreation, but increasing numbers of bass fishermen find milfoil to be a great benefit to their sport. Milfoil provides important habitat for waterfowl, fish, and microinvertebrates, which contributes to the health of the entire aquatic ecosystem. Before milfoil is removed from that ecosystem, those benefits, and the consequences of removing them, must be more fully evaluated. (30)

The Washington Environmental Council recognizes that the aquatic plant, Eurasian milfoil, has become a nuisance to water sports in Washington State in recent years. However, we have never seen any firm indication that it represents a safety hazard to responsible swimmers and boaters. In light of this, we are increasingly concerned over the potential application of toxic chemicals in our lakes and waterways for the removal of an aquatic plant which, by the Corps' own admission, has benefits to wildlife (page 7) and lake nutrient level reduction (page 50). This is particularly true when the Corps' entire economic justification for the project is recreational (page 28). (32)

Page 2-1 through 2-2 (of the design memorandum) - Existing conditions and potential for milfoil growth. Although various figures are given for estimated milfoil occurrence in various bodies of water and potential acreage that <u>might</u> support milfoil growth, no indication is given of the fluctuations that have occurred in recent years (i.e., both increases and decreases in extent of plant coverage with no indication that milfoil might increase to the level indicated on page 2-2) and the basis for the potential areas given on page 2-2 is highly suspect. For one thing, the factors which were explicitly listed do not include wave action effects and other factors that are known to influence milfoil distribution. It is likely that a much smaller area would define the real potential maximum and since milfoil growth dynamics are so imperfectly known that milfoil coverage may even be declining in Seattle area waters. For example, the 250 acres indicated in the design memorandum for milfoil growth in Lake Sammamish in 1978 is a decrease of 125 acres (fully 50 percent of the remaining growth) from 1977 conditions (Goodpasture, J.M., et al., 1978, "Distribution and Community Composition of Aquatic Macrophytes

in Selected Waters of King County", Metro, Seattle, p. 71). The design memorandum neglects to put the situation into the perspective of reality by mentioning such facts which are in the same reference relied upon for other information that is mentioned. The unsubstantiated claims with regard to potential for milfoil growth in the Columbia River basin are also suspect. (39)

Response: The adverse impacts of milfoil growth upon recreational use of Lakes Washington, Sammamish, and Union are well documented. The need for some kind of management program is agreed upon by most of the agencies, organizations, and individuals who have given us input. Our proposed treatment areas for the control program were based on METRO's, aquatic plant survey reports, resource agency reports, and public input. All the proposed treatment areas are experiencing problems associated with milfoil.

Aquatic vegetation is beneficial in varying degrees to fish, waterfowl and aquatic invertebrates. Milfoil, an introduced exotic species, tends to displace other aquatic vegetation or dominate the community, creating a near monoculture condition. The net impact on the aquatic system then becomes negative as diversity and community stability are reduced.

The Seattle area appears to be less than the optimum habitat for milfoil; some years are high-growth years and some years are not. The potential for expansion of the range of milfoil does exist. A number of successive "good" years could result in a rapid spread. WES estimates that a total of nearly 5,000 acres in Lakes Washington, Sammamish, and Union could eventually become infested.

Eastern Washington appears to be a better milfoil habitat as evidenced by its rapid spread through British Columbia's Okanagan Lake chain. We believe it is very important to have a program to prevent milfoil expansion into the Columbia River system.

Eventually, milfoil should be absorbed into the aquatic system, but the time frame is impossible to estimate. Some cases on record document the seemingly natural decline of extensive milfoil populations within 10 years of its introduction. Other areas, the Tennessee Valley system for instance, have had milfoil problems for nearly 20 years, with no indication that the plant population is declining.

9.09.3 Comment-Response Category 3 - Treatment Areas.

Comments: Page 6 - Mention is made of watermilfoil related problems in the Tennessee Valley system. How relevant are such problems to the somewhat different environmental conditions of Washington and, similarly, are the comments in the draft EIS regarding sedimentation and water temperature increases in Tennessee relevant to the situation in Washington? (9)

Page 8 - It is acknowledged on page 8 that "most of the literature dealing with" factors affecting Eurasian watermilfoil growth "are from other parts of the country." In fact, much of it is from warm water areas and applicability to colder northwest waters is uncertain. A general fault of the draft EIS is the almost total lack of data specific to the proposed project areas in Washington. (9)

The discussion of environmental factors on pages 8, 9, 10, and 11 mentions conditions in Tennessee and elsewhere but fails to mention how such factors in, for example, the Seattle area might affect Eurasian watermilfoil occurrence and growth. What about Seattle's famous rainfall (it is noted here that Eurasian watermilfoil problems in the Seattle area became a public controversy during a period of local drought)? How might this affect growth? If the optimum Eurasian watermilfoil photosynthesis temperature is 35° C, what does this mean for Lake Washington where water temperatures are substantially less year round and only exceed 18° C in the warmest part of the summer. What are the pH, alkalinity, and salinity conditions in areas of Washington that treatment is proposed for and what affect might these parameters have? (9)

The basic concept of the draft EIS is good. That is, control of the milfoil. However, the areas outlined in the draft EIS are only those of a high-use nature. Failure to make substantial control efforts in other areas - i.e., all of Union Bay, Lake Sammamish (including the outlet river to Lake Washington), Lake Forest Park-Kenmore, Juanita Bay, Yarrow Bay, Cozy Cove, Mercer Island, etc. will result in continued fragmentation of the milfoil and the subsequent spreading of the plant. (15)

If the Corps were to assume responsibility for Pritchard and were willing to substitute two other locations for those already treated, then the city and the Corps could cooperatively treat all of the areas targeted without either having to bear the full costs of control. This assumes that the Corps would agree to use a method of control acceptable to the city of Seattle. (18)

The Water Department has the responsibility for supplying the Seattle Metropolitan area with drinking water. Water supply sources are located in the Cedar River and South Fork Tolt River watersheds. There are areas within the Cedar River watershed and the reservoir system (Lake Youngs) that are susceptible to infestation by milfoil. Fragments transported by waterfowl would be the most likely method of infestation. A heavy vegetation growth, characteristic of milfoil, would markedly increase the eutrophication process occuring in the lakes and could add taste and odor problems to the water supply. The decomposing plants increase the concentration of dissolved organic substances which can react with chlorine during water treatment to form minute amounts of substances which might be carcinogenic. For these reasons we would wish to avoid milfoil infestation into the watershed if at all possible. Protection of the watershed areas may

be considered as areas for treatment in lieu of the sites already being controlled by the Parks and Recreation Department. (18)

Section 1.05 - The discussion contained in this section mentions that local jurisdictions must submit their proposed areas for treatment to the State Department of Ecology for inclusion in the total state proposal. We suggest that the Corps of Engineers explain how the areas proposed for control listed in the draft EIS were selected for the proposal prior to the submittal of areas for the treatment by local agencies. Such a discussion should explain any agreements made by local agencies prior to the issuance of the draft EIS. (18)

How were areas of milfoil infestation identified? My experience in Yarrow Bay would indicate that the area of milfoil growth along the east side of Yarrow Bay is more extensive than indicated by figure 9. (19)

Is it practical to treat only small portions of large milfoil growth areas? In many cases the proposed program only treats 100-foot-wide channels near the shoreline. Won't the milfoil rapidly reinfest these channels? (19)

We recommend that control be directed to areas of heavy boating and swimming use. In your discussion of marsh areas (page 41) you state, "Care must be taken in the selection of control methods to insure that the fish and wildlife values of sensitive sites are protected." Unless the milfoil is deterimental to fish resources in these areas, would it be necessary to attempt to control it in these sensitive sites? (24)

According to the draft EIS, areas where heavy concentrations of milfoil occur should be targeted for 2,4-D application, but nowhere in the draft is there an explanation of what conditions constitute a heavy infestation. Also lacking are reports on the actual extent of milfoil infestation in the bodies of water proposed for treatment. Before any recommendation for spraying is made, indepth studies of the particular sites should be made. Recommendations should be drawn from such research, not from studies on sites elsewhere in the continent, since each site has conditions which may radically differ from other sites. (28)

Pages 16 through 28 - The discussion of the proposed control program for the Seattle area lacks critical site-specific information. Neither are references given for the information which is presented. What is the basis for the information presented in figures 4 through 12? Is this one year's worth of data or more? Does the occurrence indicate conditions for 1979? Are there density differences and, if so, what are they? (9)

Page 31 - Although it is stated on page 31 that site-specific conditions would be important in the selection of the appropriate chemical formulation, no such information is presented in the draft EIS and no discussion is presented to indicate how such considerations

might enter into such decisionmaking other than a notation with regard to granular formulations. Timing considerations with regard to salmon area is also mentioned; however, no information regarding these areas or the nature of proposed timing considerations is given in the draft EIS. (9)

Page 38 - It is stated in the draft EIS that the lakes for which treatment is proposed in the Seattle area "have important fish and wildlife areas," including "several ecologically important marshes." However, these are not identified in the draft EIS, nor are measures which would be taken to protect them listed. If chemicals were to be utilized, for example, how would these areas be protected from the extensive drift that is known to accompany herbicide use, including the use of granular formulations? (9)

The draft EIS is inadequate as a document from which to make an informed decision regarding the topic matter. Particularly noticeable is the nearly complete lake of site-specific information and the absence of a meaningful analysis of the environmental and health risks resultant from chemical control methods. (9)

Page 41 - It is acknowledged in the draft EIS tht "Marsh areas are very important to the ecology" of the various Seattle area lakes and that "Care must be taken in the selection of control methods to insure that the fish and wildlife values at sensitive sites are protected." However, no information is presented in the draft EIS as to how such protection might be accomplished for various control measures. (9)

What limitations and/or special techniques are to be used in or near the "sensitive" areas discussed in paragraphs 2.02.11 and 2.03.11? (19)

The final EIS should contain, in the text, more specific information on environmentally sensitive locations and times, compared with proposed treatment areas and times and chemical concentrations. Information should be provided on when and where sensitive life stages of important fish species occur. Maps would be most useful. As it is, the information on potential aquatic impacts is mostly general and abstract. Providing more site-specific information would also indicate more accurately the need for mitigation measures. (20)

The 1977 to 1978 salmon program at the Issaquah Creek Hatchery cost the state about $120,000 to produce 96,000 pounds of fish. This production has an approximate value to the various fisheries of $1,440,000. All fish released from the hatchery must pass through this site, and small chinook would probably rear in the vicinity for some time. (24)

Marshlands need to be better identified and specific protective measures need to be defined. The Lake Washington and Lake Sammamish wetlands become increasingly valuable for the resting and feeding of migratory waterfowl as such habitat becomes locally more scarce. (29)

Because of the varying individual character of the aquatic ecosystems in the proposed treatment areas, the need for site-specific analysis is paramount to any consideration of milfoil "management." Some areas may contain spawning grounds for bass or rearing grounds for migrating salmon; some may be important habitat areas for waterfowl; still others may have water currents that make chemical treatments extremely hazardous due to possible drift effects. Little distinction is made in the draft EIS between lake habitat and river habitat. The draft EIS is totally deficient in site-specific analysis of this kind. (30)

The EIS is intended to help public officials make decisions that are based on an understanding of environmental consequences, but this EIS cannot fulfill this purpose because it fails to adequately describe the environment of the areas to be affected by the proposed program. Section 2 suffers from a lack of site-specific information. This is critical because the actual treatment methods to be used at each specific site (and the subsequent environmental impact) have not yet been determined and, according to the draft EIS, onsite environmental conditions will be a factor in determining which treatment methods are to be used. The information presented in section 2 is of such a general nature that the decision on which treatment method to use at a specific site cannot be made based on an understanding of the environmental consequences. In order to make an informed decision about which treatment method to use at a specific site, it is necessary to know if the area is an ecologically important marsh, if the area is subject to herbicide drift, if the site is an important salmon area, if the area has any irrigation water intakes, if the site is an important wildlife area, if the area is subject to periods of low dissolved oxygen concentrations, etc. The draft EIS should have, but failed to identify the critical onsite environmental conditions, the knowledge of which is necessary for proper decisionmaking. (35)

Response: The information from other parts of the country and Canada was given as background only to show the possibilities that exist when milfoil is introduced into a new area. Even though the environmental conditions are different, the present situation identified in Washington indicates that milfoil can do well here and that problems encountered from milfoil infestation in other areas of the country may well be encountered in Washington. The conditions in the British Columbia Okanagan Lake chain are very similar to our Okanogan area and much of eastern Washington. Information gained from milfoil problems experienced in British Columbia and impacts and effectiveness of alternative treatments have contributed significantly to the development of the proposed prevention program.

The test data given from other parts of the country on chemical toxicity are relevant to our area in that it does provide a general toxicity level. Again, information from British Columbia work was used where possible because of the similarity in environmental conditions. Recognizing the lack of data specific to the northwest, WES is conducting a study to develop a northwest data base. Study results will be used in the continued development of the Corps' program.

Public input, vegetation surveys, aerial photographs, and contacts with public recreation agencies were used to identify potential areas for milfoil control. The criteria presented in paragraph 1.07.3 of the EIS were developed and used in selection of the proposed treatment sites.

The information contained in the draft EIS (figures 5 through 12A) depicting locations of milfoil growth in Lakes Washington, Sammamish, and Union was obtained from 1978 aquatic plant surveys performed by METRO. The figures on milfoil location in Portage Bay have been updated to reflect 1979 conditions. The METRO survey reports present milfoil density gradients and the percent of milfoil of the total aquatic vegetation in the locations. These parameters are not expressed in the EIS figures, but were considered in the site selection process.

Public recreation areas identified as being obstructed by milfoil growth were given priority for treatment in Lakes Washington, Sammamish, and Union. Information on recreation obstruction was obtained from the city, county, and state parks departments. Other high-use areas identified as having moderate to heavy milfoil growths constituting a significant obstruction to usage were identified through imput from the METRO survey reports, aerial photographs showing high concentrations of boating structures, citizen input, and resource agency reports.

Efforts to eradicate firmly established populations of milfoil in large water bodies have not been successful in other parts of the country and are not believed possible in the large lakes of Washington. Because of the small chance of success for an eradication effort on Lakes Washington, Union, and Sammamish, the objective is to treat the most heavily affected areas, reducing the obstruction as much as possible without causing serious environmental impacts. The proposed treatment of the swimming beaches and high-use areas would be a maintenance operation with retreatment required periodically, depending on treatment method, because of reinfestation from fragments or root structures (bottom screening would require periodic maintenance rather than retreatment).

Salmon spawning areas and migration routes have been supplied by the Washington Department of Fisheries and have been incorporated into figures 5-12A in the final EIS. Any herbicide treatment in those areas would be coordinated with the Washington State Department of Fisheries and treatment timed to coincide with low salmon usage.

Important marsh/wetland areas have also been depicted on the EIS figures. Generally, these marsh/wetland areas are not threatened by the treatment of the high-use areas since they are not located within areas having high boating usage. Should chemical treatment be used, those marsh/wetland areas adjacent to treatment areas may be subject to chemical drift. Monitoring has been added to the program, including persistence and drift tests. Formulations of 2,4-D included in

the program as acceptable treatment methods have a high degree of selectivity for milfoil, and concentrations necessary to control milfoil would not affect most native wetland plant species.

The estimated costs for chemical control measures include a public notification program for upland residents to inform them of the chemical to be used, the time of treatment, and any restrictions for water use. Also included are items such as posting signs and operating a chase boat. The actual implementation would be a requirement of the contractor doing the work.

9.09.4 Comment-Response Category 4 - Treatment Methods.

Comments: Page 14 - It is indicated on page 14 that mechanical harvesting "causes a spurt of growth." Possibly, however, research in other locations has demonstrated that repeated mechanical harvesting leads to reduced growth in following years. The reduced growth is not mentioned. (9)

Page 52 - It is noted on page 52 that studies have shown that "repeated harvesting will eventually decrease the need for harvesting" (i.e., harvesting has a beneficial control carryover effect). This information is relevant to comment No. 17 and should have been mentioned on page 14 of the draft EIS. (9)

Page 56 - It is acknowledged on page 56 of the draft EIS that the "edge effect" of mechanical harvesting may be beneficial with regard to game fish (as is the mere presence of Eurasian watermilfoil itself as was noted above). (9)

Mechanical harvesting has been used in lakes and waterways in Ontario, British Columbia, and Wisconsin without significantly impacting fish and wildlife (Wile, 1978: Environmental Effects of Harvesting. J. Aquat. Plant Management - from the COE bibliography - plus several references in the bibliography of Warnock et al. 1978, "The Other Face of 2,4-D, A Citizen's Report," South Okanogan Environmental Coalition). For the final EIS, we request that the Corps include data reflecting greater serious research into mechanical harvesting, including examples of where it has been used successfully. (30)

In light of the above information on mechanical harvesting, we are concerned that the emphasis of the draft EIS appears to be on chemical control. Information on harvesting is scattered throughout the document, with no mention in an appendix of the facts and figures on performance available from existing United States and Canadian harvesting programs. The bibliography suggests that much less attention was given to researching harvesting than was given to chemical controls. Until this deficiency is rectified, the draft is inadequate. (30)

We recommend that the Corps, out of concern for availability of harvest equipment (draft EIS, page 12, paragraph 4), oversee ordering the purchase of a harvesting machine posthaste. Personal communication (11 September 1979) with Mike Perkins, principal investigator for METRO milfoil research demonstration project, indicates that harvesting machines are readily available for sale on relatively short notice. Perhaps the State Department of Ecology, as umbrella agency, is the appropriate organization through which this could be accomplished. Other agencies might include municipalities, counties, homeowner associations, waterfront management districts, or regional authorities such as METRO. Because lack of availability of harvesters has consistently been an excuse of those who promote chemical control, we urge that the Corps plan for 70 percent (with 30 percent local) funding of a harvesting machine. (30)

We wish to carefully clarify that harvesters are readily available for sale, and we urge the Corps to promote such a purchase and include it in the aquatic plant control program for the State of Washington. (30)

The benefits of harvesting milfoil with an aquatic mower are not considered in great enough depth in the draft EIS. Some research suggests that harvesting poses much less risk to fish and wildlife in and around the treatment area. Habitat disturbance is minimized, since the plant cover along the bottom remains in place, and there is no threat of toxic impacts on adjacent areas as there is with herbicides. And, by removing the nutrients in the plant material harvested, the need for perennial retreatments may be reduced along with the costs. (30)

Where control is deemed necessary, the WEC supports the Corps' proposed use of mechanical controls. The techniques have been used with great success in the lakes and waterways of Ontario, British Columbia, Wisconsin, New York, and California. Mechanical harvesters can be used without significantly impacting fish and wildlife populations and may actually be useful in creating conditions beneficial to wildlife. According to the EIS, the mechanical harvest control methods' negative environmental/sociological impacts. (32)

In light of the obvious benefits of harvesting, the WEC is concerned that the emphasis of the draft EIS appears to be on chemical control. Information on harvesting is scattered throughout the document, with no mention in an appendix of the facts and figures on performance that are available from the existing harvesting programs in this country and Canada. The bibliography suggests that much less attention was given to chemical controls. (32)

I believe mechanical is the only sane alternative. As for the disposal problem, there are many alternatives. To name a couple:

1. Compost it and put it in our depleted and deficient (of minerals, organic loam, and much more) fields.

2. In view of the gas problem, the rotting milfoil is an excellent source of methane or material for alcohol production. There are many alternatives. (1)

Page 11 - Old data is quoted (i.e., 1965) regarding the economic feasibility of use of harvested Eurasian watermilfoil after composting as fertilizer. How feasible is composting for fertilizer today? The draft EIS fails to answer this question; however, other researchers have found composted Eurasian watermilfoil to be useful as a soil additive and as biomass for energy conversion. (9)

The EIS fails to discuss how the harvested milfoil will be disposed. Considering its "high percentage of crude protein," local farmers may be willing to use it for supplemental feed as long as it is chemically untreated and readily accessible before being allowed to decompose. (14)

On page 11, you state: "One of the main problems with harvesting milfoil is upland disposal. Transport and handling are expensive and many attempts have been made to find a use for the harvested milfoil to partially defray the cost." Would it be possible to allow gardeners to pick up composted milfoil? Milfoil could serve as a source of potassium. It may not be necessary to transport, but it could be given to gardeners who would haul it away. (24)

We request that the Corps reconsider the usefulness and disposal of harvested milfoil. In 1977, the Ontario Agriculture College reported that harvested milfoil from their control program was composted. The resultant potting soil is packaged and sells well on the Ontario market ("Nutrition from a Nuisance," Ontario Agric. College Alumni News, XVI No.3, April 1977). The Wisconsin Department of Natural Resources reported that in 1978 local gardeners in Madison willingly removed and used all available harvested plants (personal communication Dunst-Edmondson). Dried, composted milfoil is reported in the draft (page 11) as having an N-P-K content of 3-2-5. This is higher than the 1-1-1 content of composted steer manure - a soil conditioner/fertilizer used widely (Country Journal, July 1979, page 54, "The Relative Worth of Compost Materials"). Given the preponderance of home and truck gardening in the Seattle area and the anticipated cooperation of local environmental and agricultural organizations in coordinating aquatic plant disposal/composting efforts, the disposal "problem" could, in fact, become a benefit. (30)

The Corps' emphasis on the problems of harvested milfoil disposal is unjustified. Given the preponderance of home and truck gardening in the Seattle area and the cooperation of local environmental and agricultural organizations in coordinating disposal/composting efforts, this so-called "problem" could actually become a side benefit. (32)

The View Ridge Community Pea Patch is already involved in composting the milfoil harvested by METRO earlier this year. The coordinators of the project, Emily Mandelbaum and Jim and Viki Bruvold, are enthusiastic about expanding their facilities to a larger scale. (32)

This summer, the Department of Parks and Recreation has installed polyvinyl-chloride-control coated fiberglass screens to inhibit milfoil growth at four public beaches, two of these beaches being Madrona Park and Seward Park on Lake Washington. The department has also purchased screening material for installation at Mt. Baker Park next summer. The Department of Parks and Recreation also desires to eventually purchase material for Madison and Pritchard Island beaches as well as for the Leschi and Lakewood moorages. The installed screens would be removed and stored at the end of the swimming season and would be reinstalled every summer thereafter. Therefore, the city's actions have already begun control activities at two of the three Lake Washington beaches proposed for treatment by the Corps. Pritchard Island remains an area proposed for control by both agencies. (18)

Section 1.04.6 - The paragraph concerning bottom shading states that screens are justified only for high use areas. Since the scope of the proposed control program is limited to high use areas, the fact that shading would eliminate all growth rather than just milfoil should not be a drawback to its use in the control program as stated in this section. (18)

We are concerned that the various screening techniques have been prematurely discarded, mainly due to short-term economic considerations. Over the long term, a single screening application may compare more favorably with chemical treatment which must be frequently repeated. (20)

The projected cost of fiberglass screens per acre should be included to help decisionmakers select alternatives for relatively small areas where use of chemicals would be risky for food fish at certain times of the year. (23)

SAS supports portions of the Corps' draft; specifically, bottom screening in locations of high use such as swimming beaches and in limited access areas such as under docks, plus mechanical harvesting. (29)

The draft EIS presents bottom screening as the most expensive option; yet there is evidence to the contrary. The final EIS needs to explore and confirm the option of renting bottom screening as well as cost comparisons made at the 4 September 1979 public hearings by Mr. Jim Carsner of Aquatic Control, Tacoma. Mr. Carsner stated that for the average size homeowner's lot, on a rental basis, bottom screening is below the cost of herbicide treatment for the same area. Mr. Carsner also indicated that the initial purchase option with a maintenance agreement was cost competitive with herbicide costs. (29)

Other points that require clarification or disclosure in the final EIS include:

1. Bottom screening does provide complete control.

2. Because the total control is provided within a short time (see below), the screen is reusable; i.e., a single panel could be moved from area to area within a single growing season. Thus, half or more of the anticipated initial capital cost could be saved.

3. The city of Seattle is currently using bottom screening at several locations.

4. The METRO project includes bottom screening.

5. The draft EIS (5.06) states that bottom screening would lead to the elimination of benthic organisms in the food chain. We refer you to remarks made by Mike Perkins at the 4 September public hearing and to his paper which states, "This material (aquascreen) appeared particularly attractive since it would allow for dissolved substance transfer at the sediment-water interface and was effective after short periods of coverage." (Perkins, Michael A. et al., 1979. "The Use of Fiberglass Screens for Control of Eurasian Watermilfoil," paper presented February 1979 at Efficacy and Impact of Intensive Plant Harvesting in Lake Management, Madison, Wisconsin. Based on reference to Mayer, J. T., "Aquatic Weed Management by Benthic Semi-Barriers." J. Aquat. Plant Manage., 16.31 (1978).) (29)

Another alternate technique which is given inadequate attention in the Corps' EIS is bottom screening. It is deemed an improbable control because of its high per-acre cost. However, this technique can be very effective in small areas around moorages and swimming beaches where complete control is desirable. James Carsner pointed out at the public hearings that the high-cost figure in the draft and public brochure is deceptive. Screening would be done in areas much smaller than an acre. He estimated the cost for a private homeowner would be $700 to $800 (and screens can be used year after year). With the rental programs which are available, that cost could be reduced further. High initial costs would be offset by long service life. (32)

<u>Page 41</u> - It is noted on page 41 that "many private property owners . . . pump small amounts of water (from the Seattle area lakes) for irrigating law(n)s and gardens." Such utilization of those waters would appear to preclude the use of chemical control methods. (9)

A more complete explanation should be given as to why endothall, diquat, and casoron have to be used in the King County Log Boom Park area, the Juanita Beach County Park area of Lake Washington, and the Washington State Park area of Lake Sammamish. If complete vegetative removal is required for the immediate park area where high use areas and/or swimming beaches exist, we believe that the "primary control methods" of mechanical harvesting and 2,4-D application should suffice. Where necessary, they could be supplemented with bottom shading, hand removal, diver-operated dredge, and gravel or sand blankets which may be required anyway. (14)

The city agrees with the proposal of the Federal agency to cover 70 percent of the costs of whatever combination of measures the local government selects. We are concerned that, given the tenor of the draft EIS, the Corps will only cover the costs for a chemical control program. Such an action would force local governments in the direction of chemical application, even though other methods may be more desirable for both ecologic and economic reasons. (18)

Mechanical harvesting, covering the substrate with screens, and herbicide application are the three popular control measures. The first two appear promising in certain situations and herbicide use (2,4-D) is known to be effective for milfoil eradication. However, herbicides are toxic to fish. No impacts to salmon are expected from the physical control methods, if properly conducted. (23)

1.04.5 - Chemical Control - We ask why chemicals other than 2,4-D BEE are proposed when (1) more may be known on the toxicity of this chemical than of the other candidates; (2) 2,4-D BEE kills the entire plant, thus reducing future growth, while the other chemicals may only retard growth; and (3) 2,4-D is selective to the target species, thus reducing possible problems of low-dissolved oxygen which could be more severe if the majority of the vegetation (several species) began to decompose following treatment with the broader spectrum herbicides. (23)

We fail to understand the recommendation for use of chemicals at Lake Sammamish State Park prior to the results of METRO's literature review and information on the concentration of 2,4-D BEE throughout the water column. (23)

The draft EIS does not take into sufficient account the viable existent alternatives to 2,4-D application, but seems to recommend the use of the herbicide based on the desires of a few property owners. The larger concern for public health is neglected in the document; so-called "cost effectiveness" appears to be the primary reason behind the recommendation of 2,4-D application to control Eurasian watermilfoil. (27)

Before a final herbicide recommendation is even considered, more available knowledge of alternatives and their effectiveness should be studied, and real consideration of studies which show 2,4-D to be a health hazard should be made. (27)

It is surprising that the Corps is recommending 2,4-D and deemphasizing aquascreens and mechanical harvesting, particularly when Seattle METRO is working on feasibility studies of these methods. Reports from Mr. Mike Perkins, who has supervised the METRO project, reveal that a combination of the two methods is extremely efficient in controlling milfoil. The draft EIS contains virtually nothing on this project. (27)

Seattle Audubon Society (SAS) does not support the proposed use of chemicals to control the spread of milfoil. Such use is an alternative about which we are greatly concerned. While the methods we have outlined above, mechanical harvesting and bottom screening, may have certain restrictions to their use, these are known and can be mitigated or minimized. Long-term toxic effects of herbicides on plants, animals, and humans are, on the contrary, hotly debated within the scientific community. We believe that while such debate continues unresolved, these chemicals should not be used, especially when cost-competitive alternative techniques are available. (29)

SAS would like to be a part of the larger community working toward nonchemical management of aquatic plants in the State of Washington. (29)

The final EIS should more explicitly discuss whatever is known about long-term treatment needs for the various control alternatives and the resulting long-term impacts, including economic effects. What can be said about degree of reinfestation of milfoil under the various types of treatment? How often will chemical and mechanical treatment be needed? Comparison should be made with the long-term effects of no-control program. (20)

The control alternatives suggested for most of the areas proposed for treatment would require treatment annually and throughout the season. We would suggest a discussion be included describing the number of treatments required over a growing season and the impact of long-term repeated treatment. (21)

Section 1.04 should be limited to a description of each of the methods and an objective assessment of its effectiveness and limitations in controlling milfoil. This section, as presently written, seems to assume that herbicides are the best control method and makes general statements concerning costs of the other alternatives. We believe that if these comparisons are to be made in the EIS, then they should be made in quantitative terms with the best current data. (18)

We suggest that the final EIS include a cost breakdown for each method, or combination of methods, so that a better evaluation of comparative costs and benefits may be made. The analysis should be arranged in a manner where several control methods can be evaluated and it should contain the basic elements essential to explain the cost benefit ratio. (18)

The final EIS must include a comparative cost presentation of all proposed control methods. Also, we urge you to coordinate your program with both the Seattle and the METRO work in order to take advantage of their experiences and the bottom screening itself which is already being used. (29)

No information is given in the draft EIS comparing costs of mechanical and chemical control. The draft EIS states (page 60) that "Many property owners . . . feel that chemical control is the most effective and the least expensive available . . . ." Is this feeling justified? Perhaps the homeowners have felt that they had only a chemical option. By closely reading the draft EIS, it indicates that mechanical harvesting is as effective as chemical control. This comparative information needs to be drawn together and presented with accurate cost data that reflects the local area, including the importance of salmon as it is impacted by chemical controls. Mechanical harvesting cost estimates from other parts of the country reflect a range from $70 to $150/acre (Smith, Gerald N., 1979. "Recent Case Studies of Macrophyte Harvesting Costs - Options by Which to Lower Costs," Aquatic Control Technology, Inc., Wayland, Mass.). Other sources extend this range greatly (personal verification, Washington Environmental Council). In the final EIS, harvesting costs must be clearly defined and compared to equally clearly defined costs of chemical control. (30)

There is little information presented in the draft EIS with which to make decisions on other treatment alternatives such as bottom covering with aquascreen. Biological treatment is dismissed shortly as either infeasible or a subject for future research. We feel these options must be explored more fully before final treatment decisions are made. (30)

We concur with your statement on page 67: "Biological control may be the most economical and the least disruptive method to deal with milfoil." However, we are concerned with the long-term impacts of the importation of exotic species. It is illegal to import, or have possession of, the white amur in Washington State (WAC 232-12-670 of RCW 77.04). For biologic control, we would recommend using native species of insects or planting native aquatic vegetation such as water lilies or other macrophytes that may resist milfoil infestation. Additional research should be performed to identify the best biologic control to use (page 62). (24)

No information is given comparing costs of mechanical and chemical control. Are we to assume, therefore, that the costs are similar? The EIS states on page 60 that "Many property owners . . . feel that chemical control is the most effective and the least expensive available." Is this feeling justified? The Corps' EIS indicates harvesting is as effective as chemical control. It might well be more effective when the necessity of refraining from chemical control during optimum spray times, because of salmon spawning season, is considered. Estimates from other parts of the country on harvesting run from $62 to $600 per acre. Even with the wide variation in costs according to individual lake conditions, mechanical harvesting still appears cost competitive when compared to the $300 per acre rough estimate for chemical control given at the Department of Ecology's

public hearings in April 1979. As was mentioned by James Carsner of Aquatic Control, mechanical harvesting will become increasingly attractive as the costs of petrochemically derived herbicides continue to spiral upward. Harvesting costs must be clearly defined and compared to equally clearly defined costs of chemical control in the final EIS. (32)

We are pleased that the Corps of Engineers is developing such a program which appears to allow for local selection of control methodologies and which provides a funding mechanism by which the program can be implemented. The program framework appears to be consistent with the Metropolitan Council Water Quality Committee's current policy of discouraging the use of herbicides in Lake Washington for the control of Eurasian watermilfoil until more is known about the long-term effects of such applications. (6)

METRO is a cosponser, along with the DOE, University of Washington, city of Seattle, and King County, for the Union Bay Research Demonstration Program which is investigating alternative treatment methodologies for the control of milfoil in Union Bay. Included in the research program are mechanical harvesting and use of the bottom cover "Aquascreen," as well as a scientific literature review survey for not only 2,4-D, as stated in your draft EIS, but will also include endothall (dipotassium salt), casoron, and diquat. One of the goals of the Union Bay Milfoil Demonstration Project is to identify costs associated with harvesting and bottom covers in Union Bay. This information should be available in October and can be provided to you to assist in your cost analysis. The primary use of this information will be by local agencies in selecting control methodologies to be financially supported by your program. (6)

My concern is that of a citizen who is becoming alarmed at the efforts to block the control of Eurasian watermilfoil by chemical application - the most cost-effective and time-tested method known. I strongly support your program to control Eurasian watermilfoil. I want to use my lakefront for swimming and recreation. I do not favor expenditure of public funds on costly and impractical ideas such as mechanical harvesting or bottom shading with aquascreen. Many lakes in Washington have been treated chemically for more than 20 years successfully. Why abandon the proven methods because of some emotional speculation about chemicals? (17)

While different control methods would be appropriate in different cases, extreme care should be taken to insure that impacts to fish and wildlife are minimal. Milfoil control measures would require Hydraulics Project Approval from the Departments of Fisheries and Game. (24)

It appears that the selection of a treatment program for selected high use areas (section 6.02.1.2), coupled with a prevention program

(section 6.02.2), is the best choice from the alternative scopes of treatment (section 6.02). As pointed out in section 6.02.1.1, eradication of the Washington State watermilfoil infestation is neither practical nor attainable. (36)

Response: The Corps is proposing a program which provides the opportunity for the state and participating local jurisidictions to select from a number of treatment methods. Site specific conditions and the desires of state and local governments would determine what treatment measures, if any, are used. To be eligible for Federal cost sharing, however, local governments must include one, or a combination, of the methods proposed in the Aquatic Plant Management Program for each specific site.

All of the proposed treatment methods are effective in controlling milfoil. Because of regrowth from root crowns or cut stems, or from fragmentation from other populations, the control in the Seattle area lakes is considered to be a maintenance-type operation with repeated treatments necessary. Chemical treatment would be required once a year and mechanical harvesting would have to be done at least twice a year. Bottom screens would last several years, but annual maintenance would be required. The need for any treatment may decrease with time because the stress put on the milfoil populations by mechanical or chemical treatment may cause a decline of the populations to below nuisance conditions.

The basis for including the application of 2,4-D in the proposed management program is:

- 2,4-D is very selective to milfoil and would kill root structures.

- 2,4-D is the least costly alternative.

- 2,4-D is licensed for use for aquatic plant management by the U.S. Environmental Protection Agency and the Washington State Department of Agriculture.

- 2,4-D has been used extensively for a number of years for aquatic plant management in the Tennessee Valley system and the southern states without apparent environmental or public health problems.

The use of 2,4-D is only one of a number of treatment methods available under the proposed program. In each case where its use is recommended, an alternative acceptable method is also presented. Because some areas, such as swimming beaches, would not be adversely affected by the elimination of a large range of aquatic plants, other chemicals licensed for use in of aquatic plant management (i.e., endothall, diquat, and dichlobenil) were included in the treatment alternatives.

Additional information on chemicals presently acceptable for use under the management program can be found in paragraph 9.09.5, appendix C, and the text of the final EIS.

Studies are progressing on several possible methods of biologically controlling milfoil. Stringent regulations by the State of Washington and the U.S. Department of Agriculture prevent the importation of exotic species. No biological control agent has yet been able to satisfy the requirements for use against milfoil. If any biological control becomes available, it would be evaluated for inclusion in our program and reported in supplements that would be prepared annually for the management program.

A complete listing of the costs of mechanical and chemical methods has been added to the final EIS (paragraphs 1.04.1-1.04.6 and appendix A). Based upon public comment on the draft EIS and at the public meetings, it appears disposal of harvested milfoil may be possible at a cost lower than estimated should there be a need for the material at the time of harvesting. The contractor would have the responsibility for disposal of harvested milfoil and would select the lowest cost alternative that complies with environmental requirements.

9.09.5 Comment-Response Category 5 - Use of Chemicals.

Comments: I heartily oppose the treatment of the Eurasian milfoil with 2,4-D or any other defoliant. First of all, I cannot believe it presents little or no danger to humans. Anything that can have my entire garden lying on the ground within hours, from only the "drift" left over from the spraying of a nearby wheatfield, is very potent stuff and I can't believe it doesnt affect me. Right after that spraying, I had a miscarriage (I am not an easy risk for miscarriage). I believe it was 2,4-D. Second, the effect it would have on the environment through disrupting the balance of nature is devastating! 2,4-D kills all plants that are "broadleafs" (not members of the grass family). If you know anything of how a food chain works, you know it would affect everyone and everything rather significantly. Please don't poison our world any more. (1)

Page i - The summary of adverse environmental effects fails to include the degradation of water quality associated with chemical control due to the introduction of the chemical itself (i.e., herbicides are toxic substances whose introduction is a violation of water quality standards regardless of secondary effects such as the lowering of dissolved oxygen levels during biomass decomposition). (9)

Page 13 - The discussion of chemical control is facile and fails to indicate either the probable efficacy or the public health and environmental risks of the introduction of such toxic substances into water. Discussion later in the draft EIS is similarly inadequate. (9)

With regard to all of these chemicals, but 2,4-D in particular, it is mentioned that restrictions might apply with regard to "domestic or irrigation water intakes and in salmon spawning and fry rearing areas." In fact, pending a definitive interpretation of label restrictions by the EPA, it would appear that the use of 2,4-D in the vicinity of irrigation water intakes would be illegal. Regardless of legality, public health and environmental concerns are of critical importance and would mitigate the use of toxic chemicals. (9)

Little is said about the adverse effects of chemical control methods on water quality on page 51, other than to note that they "are possible." Again, the drift problem is mentioned, but no site-specific information is given so that the proposed project can be evaluated. With regard to chemical persistence, the draft EIS makes only general statements (although it is acknowledged that long persistence could occur in the sediments). (9)

Page 53 - Comments 16 and 27, above, apply here also with regard to irrigation intakes. The draft EIS proposes to "minimize" the problem of "unwanted plant kills" by "management techniques and public notification." A better method would be to follow the label instructions prohibiting introduction of 2,4-D into irrigation waters. Then the problem could be entirely avoided rather than minimized. (9)

Pages 56 and 57 and Appropriate Sections of Appendix A, Including Table 2 - The draft EIS purports to present a discussion of the impacts of chemical control on fish. That discussion is seriously deficient. Furthermore, other components of the complete aquatic ecosystem (such as benthic and planktonic organisms which serve vital functions in the system) are ignored in the main text of the draft EIS and given only cursory mention in appendix A. Again, none of the data is specific to native northwest species identified in the draft EIS to be present in the proposed treatment areas. All of the fish toxicity data presented is short-term acute bioassay data, and almost all of it is quite old and was not developed according to present-day scientific standards. As such, its value is highly questionable from the standpoint of whether or not it is adequate as an indication of short-term toxicity, let alone the much more complex toxicity questions related to the aquatic ecosystem as a whole for the long term. A fish might initially survive exposure during chemical treatment and die later due to decreased ability to survive. A salmon might migrate through the treatment area and be unable to smolt as a result. Death would occur in seawater some distance removed from the treatment/exposure site. Fishfood organisms might be adversely affected and thus, indirectly, the fish also. Salmon spawning ground sediments might become contaminated with chemical residues that could cause the death of eggs when laid later on. Reproduction might be inhibited in other ways. The draft EIS and appendix A are silent with regard to these and many other concerns. The presentation in the draft EIS is primitive by modern-day scientific standards, and is so deficient as to indicate disregard for environmental protection. Reference is made in appendix A to work that can only be classified

as inadequate and inappropriate to the northwest locale (i.e., Smith and Isom's 1967 publication regarding the Tennessee Valley). It is stated in appendix A that "no measurable toxic effect was observed on benthic fauna" by Smith and Isom. It is not mentioned that little was done to measure, and that caged fish died in the treatment areas of reportedly unknown causes. The fact is that at the levels of use for aquatic plant control, adverse effects to fish and other aquatic organisms is highly probable from chemicals such as 2,4-D and endothall. With regard to fish avoidance, the draft EIS fails to note that, for some toxicants, fish might avoid some concentrations but not others. No information to deal with this possibility is presented in the draft EIS or appendix A. Furthermore, even if a fish avoids a treated area, the mere fact of avoidance means exposure, and there is every reason to believe that levels of exposure that might cause avoidance might also cause harm. (9)

Pages 58 and 59 and Appropriate Sections of Appendix A - The discussion of public health risks is facile and inadequate. The draft EIS admits that 2,4-D "may cause an increase in malignant tumors, birth defects, and other physiological problems in test animals," but attempts to imply that such effects could only occur at high doses. Such a presentation ignores the fundamental, scientific, and ethical principles involved in laboratory toxicity testing of chemicals, and adhered to by such established institutions as the National Academy of Sciences, that the results are directly extrapolatable to humans and that the effect occurs regardless of dose level (i.e., a carcinogen is a carcinogin is a carcinogen regardless of dose level). Although a carcinogen may cause a greater number of cancers at a higher dose, it will still cause cancer at low doses. Low doses would be present in the aquatic system as a result of chemical treatment for aquatic plant control. The statement in the draft EIS that "there has never been any indication that 2,4-D, in concentrations used for aquatic plant control, would cause public health problems" is ludicrous and overlooks the nature of epidemiological studies as well as the probable fact that it is unlikely that anyone has ever really looked. It would seem to be more appropriate to state that no one has ever conducted an epidemiological study to determine the public health effects, unless the Corps has information of a contrary nature and can cite specific studies in which cancer, birth defects, mutations, and other 2,4-D related health effects were adequately studied after exposure during aquatic plant control treatment. The closest existing data which I am aware of would be phenoxy herbicide studies in Sweden, Oregon, and Washington which have indicated higher rates of cancer, miscarriages, and congenital malformations for people exposed to phenoxy herbicides, including 2,4-D. The ultimate insult after injury is to rely on the EPA in appendix A with regard to whether or not 2,4-D is a public health hazard. Although the EPA is finally reviewing 2,4-D and may eventually deregister it, the EPA moves abysmally slowly with regard to fulfilling its statutory responsibilities in this area. You should recall that after more than 9 years of controversy, the EPA only late this winter got around to declaring 2,4,5-T and 2,4,5-TP "imminent hazards" to public health. Presumably, on the day before that action, they were not and

were still legaly available for use. The EPA is following a policy for all previously registered pesticides of allowing continued use pending further evaluation. Therefore, as the EPA has admitted, the mere fact of registration is literally meaningless. As used by the EPA, the term "imminent hazard" is one of legal and political consequence rather than meaningful in terms of health or environmental reality. 2,4-D is not the only chemical posing a serious environmental risk. All of those chemicals listed in the draft EIS as alternatives do. There is evidence that diquat is embryotoxic, endothall is mutagenic, and that dichlobenil has never been properly tested to determine health risk. (9)

The scientific evidence specific to 2,4-D is quite damning in itself. You are referred to the literature search being done for METRO by Dr. Shearer. An item which I am sure will be included in that literature search is:

> Reuber, M. D. (1979). Carcinogenicity of 2,4-Dichlorophenoxyacetic acid. National Cancer Institute, Frederick, Maryland, 19 pages (presented in Portland, Oregon, on 15 June 1979) (9)

Tables 1 and 2 provide data on acute toxicity only. What evidence is there of toxicity which is less than acute? If the control program is to be administered over a number of years (which it must in order to insure continued control), then it becomes particularly critical to know the long-term impacts of low-level herbicide levels. The draft EIS states (on page A-2) that "the long-term impacts of low concentrations of 2,4-D in aquatic systems is not known. Our literature review and review of ongoing programs has not indicated that there would be serious problems." What has the literature review uncovered? What problems were uncovered that were not deemed "serious?" Has the review uncovered actual evidence that no potential problems exist, or is the absence of documented problems an indication of scanty data? (13)

Another area of concern is the possible effects of 2,4-D on human health. The draft EIS notes that "much of the opposition to the use of 2,4-D is based on the belief that it can cause cancer and birth defects" (page A-2). The draft states further that "many scientific studies have been done, but the results so far have been inconclusive. The U.S. Environmental Protection Agency . . . has stated that the continued use of 2,4-D is not imminently hazardous to the environment." In light of the controversy over human health impacts, the draft EIS should not dismiss so readily the health issue. What evidence exists which demonstrates the safety or potential health hazard of 2,4-D? Does 2,4-D accumulate in the human body? (Further, does 2,4-D break down into a more toxic form before it breaks down into nontoxic ones?) (13)

While some information was submitted on the potential effects of 2,4-D, we believe additional information is required on the environmental and possible health effects of the other control chemicals.

Bioassays on acute and chronic effects of each of the control chemicals should be performed on various life stages of local nontarget organisms, particularly organisms consumed by humans. Monitoring during the actual management program to determine possible adverse effects may be appropriate. (14)

Should herbicides be used in Lake Washington, a substantial monitoring program should be implemented. This information would or could be used when designing lake management programs in the future. (15)

In order to identify any restrictions or constraints which must be followed in the implementation of the control methods, the final EIS should thoroughly discuss and define what "proper application" procedures entail. This is particularly necessary for the chemical treatment alternative. (18)

Section 1.07.2 mentions that granular herbicides would be used in areas where drift would be a problem. Though the granular form of herbicide would dissolve slowly and release its chemicals at a slower rate, there may still be problems with the dissolved herbicide's susceptibility to drift. This problem should be discussed in the final EIS. (18)

Fisheries agencies have expressed their reservations concerning the use of chemicals in relationship to the impact on the fishery population. For example, the Washington State Department of Fisheries indicated that "they cannot support use of 2,4-D to treat milfoil when salmon are present . . . until we have seen data on the effects of the specific chemical proposed for use on different types of salmon; i.e., both fry and fingerlings." (Reference letter, page B-15.) The Department of Fisheries also noted that any applications of 2,4-D should only be done in August when salmonid populations are lowest. The Department of the Interior recommended that "bioassays should be conducted on various life stages of nontarget organisms" if chemical methods are used. The draft EIS makes no mention of time restrictions for chemical application, nor does it mention bioassays. We suggest that the final EIS discuss both of these issues in some detail. (18)

Section 4.03.5 states that high concentrations of herbicides would not remain in the water for very long periods of time. An explanation of what comprises a low or high concentration, and information regarding how long low concentrations of herbicides would remain in the water column, should be contained in the final EIS. (18)

Section 4.06.5 discusses chemical control. The discussion contained in this section leaves many questions which we feel should be answered in the final EIS. These questions include: What amounts of chemicals will be applied per acre? What will the resultant concentrations of chemicals be in the receiving waters? Will these concentrations vary with time, and how do these variations compare with the acute toxicity levels listed in appendix A? What time of the year

would the chemicals be applied, and which species of fish are apt to be present? (18)

Section 4.08.3 mentions that endothall, casoron, and diquat have not been indicated to be injurious to public health at the concentrations used for plant control. Noting the discussion in section 4.08.2 which states, "the results of these studies have, in some cases, been contradictory and by no means are conclusive," we feel that claim should be substantiated. Further, the final EIS should discuss whether any studies have been made concerning the long-term, cumulative effects of exposure to low dosages of herbicides. It would seem appropriate to state what the possible cumulative effects of long-term low dosages will be, since the proposal involves annual treatment of control areas. In addition, some mention should be made regarding long-term effects on the food chain, since section 4.09 states that there would be no effect upon any endangered species in the treatment areas. (18)

We note that appendix A contains no information regarding the acute toxicity level to salmonids. Since salmonids may be the most valuable and sensitive species affected, this lack of information should be corrected in the final EIS. If the levels are unknown, then the risks associated with herbicide application should be listed as a possible cost of chemical usage. Appendix A also discusses biological accumulation. The discussion, as presented in the draft EIS, seems of little value since it mentions that "some" organisms accumulate 2,4-5 and "some" organisms rapidly cleanse themselves of chemicals when introduced to clean water. We suggest that the final EIS discuss this subject further and more specifically point out the effects on biological accumulation. (18)

The chemicals proposed for use as a preferred control strategy, including 2,4-D and endothall, are presently registered by EPA for the intended aquatic uses. We, nevertheless, urge caution in using these chemicals, including strict adherence to label restrictions, and any other appropriate measures to ensure that adverse effects on fish and wildlife resources, water quality, and public health are avoided. Such measures include avoiding treatment of sensitive habitat areas at sensitive times and actively notifying the affected public of chemical treatment operations. EPA also supports continued consideration of nonchemical measures as the most acceptable long-term strategy for control of watermilfoil. Our specific comments follow. (20)

The reference on page 65 (section 6.01.4) to silvex should point out that aquatic use of silvex has been prohibited by EPA. (20)

The final EIS should contain an explanation of what monitoring will take place with the chemical control program and who has the responsibility for such monitoring. Site-specific followup information on drift, persistence in water and sediments, and inpacts on aquatic organisms may be useful in certain cases. (20)

Reference should be made on page 31 (section 1.07.2) of the requirement that chemical application follow label restrictions under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). Also, the reference on page 46 (section 3.02) to the Federal Pesticide Act of 1978 should more correctly be the 1978 amendments to FIFRA. (20)

More specific information on the persistence of the proposed chemicals should be included in the text on page 51 (section 4.03.5). This material is in the appendix and should be summarized in the text. (20)

Since the problem was identified in about 1977, the Department of Fisheries has responded to proposed inwater herbicide use in the following manner, attempting to endorse milfoil control, but, at the same time, protecting our resources (Duties of the Department RCW 75.08.012):

1. Respond favorably to use of 2,4-D in nonsalmon areas; e.g., Banks Lake.

2. Respond favorably to use of 2,4-D in salmon areas if the application is timed between salmon migrations; e.g., Lake Osoyoos-Okanogan River.

3. Respond negatively if 2,4-D is proposed for application during major salmon migration periods adjacent to major migration routes; e.g., Union Bay adjacent to the ship canal and the mouth of Issaquah Creek below the hatchery. (23)

However, in 1978, we agreed to the use of 2,4-D in Union Bay if the proponent (METRO) assured us through bioassay that the application would not directly impact salmon. We understand that, after about a year of planning, the bioassay was eliminated because the Interagency Technical Review Committee for the Union Bay Milfoil Demonstration Study concluded the available funding was not adequate to thoroughly evaluate that portion of the overall study. Since METRO's ongoing studies and literature review on milfoil control are not yet available, the department has reviewed certain literature in order to make recommendations on herbicide use. (23)

We concur with your recommendations for mechanical harvesting in Union Bay any time. Until studies determine the actual concentrations of 2,4-D BEE in the water column following application, this chemical should only be used during the first 2 weeks of August, and then applied at absolute minimum levels for the protection of migrating salmon. (23)

We believe the section concerning 2,4-D (section 4.06.5.1) is incomplete but, hopefully, METRO's literature search will be of assistance. Please refer to our section on our recommendations, including selected references. Also, we do not agree entirely with the statement " . . . and no fish kills, due to the toxicity of the chemical, would be expected at the concentrations used to control milfoil."

The concentrations of 2,4-D shown in table 3, in general, exceed our recommended 0.1 mg/l maximum level for the protection of salmon. In addition, it appears the application rates on table 3 are far lower than the 100 pounds per surface acre currently proposed for use by commercial applicators in Lake Washington. (23)

Our literature review concluded that the concentrations of 2,4-D BEE, following a single application only, should not exceed 0.1 mg/l (as measured for the ester and not free 2,4-D acid) anywhere in the water column where significant numbers of salmon may be present. For multiple applications, the ester concentration should not exceed 0.031 mg/l. (Woodard, D. F. and F. L. Mayer, Jr., 1978.) (23)

Therefore, the Washington Department of Fisheries recommends the following for the protection of resources under its jurisdiction only (RCW 75.04.040):

1. Conduct a spray application of 2,4-D somewhere in Lake Washington, except Laurelhurst (Union Bay) or the mouth of the Sammamish River, any time after 15 June when the sockeye fry have emerged from spawning gravels in, or closely adjacent to, the treatment area. The rate of application (pounds/acre) should be set at the absolute minimum necessary to accomplish desired milfoil control.

2. Arrange for a competent water sampling program, similar to that considered by METRO in December 1977, to determine the concentration of 2,4-D BEE (ester) throughout the water column over time, in and outside the treatment area, to compare with the reasonably safe levels for salmon described above.

3. Treat the high-use salmon areas only after the results from above are obtained, or postpone until specified by Washington Department of Fisheries. The Department of Game should also be consulted for resources under their jurisdiction. This recommendation applies only to herbicide use and salmon resources. (23)

While 2,4-D appears to be the least damaging herbicide, we are not confident that it would not impact fish fry, nor possibly present long-term impacts to fish or wildlife production. In general, we would recommend against its use in wetlands and spawning and rearing sites for salmonids and spiny-rayed fishes. For control of milfoil adjacent to sensitive areas, we would recommend only hand removal. We have included information we have on spiny-ray habitat in Lake Washington. (25)

We have concerns over the use of chemicals to control milfoil. Because they are nonselective, we recommend that endothall, casoron, diquat, simazine, silvex, and fenac not be used. (24)

The draft EIS also maintains that "there has never been any indication that 2,4-D, in concentrations used for aquatic plant control, would cause public health problems" (page 59, section 4.08.2, 2,4-D), and further states, "none of the control or prevention alternatives

should have any effect on human population" (page 59, 4.11, Impacts on Human Population). These statements are in contradiction to several studies on the mutagenic effects of 2,4-D. One study which is not even listed in the draft EIS bibliography (Courtney, K. Diane, "Prenatal Effects of Herbicides: Evaluation by the Prenatal Development Index," 15th Annual Meeting of the Teratology Society, May 11-14, 1975) states that the greatest mutagenic effects of 2,4-D are "produced at the low doses administered over long time periods." The 2,4-D applications recommended in the draft EIS, although presented as a single series of separate treatments, would probably be followed by further recommendations for 2,4-D applications in successive years. Repeated applications of 2,4-D present dangers to fetuses, dangers which may be present in even a single spraying. (27)

The emphasis on "benefits for the nonpublic areas" is misleading for it implies that herbicides will remain in treatment areas only and does not take into account current and tidal distribution of herbicides to nonsprayed areas accessible to public use. (27)

Before any chemicals are mixed into the waters of any stream or lake, we should know what effect they will have upon our whole ecological system. Humans are a part of the ecological system. (28)

The boaters and homeowners enjoying the use of our public waters must have a balanced consideration for the rights of the larger community, specifically the right to enjoyment of waters free of toxic chemicals. Also, the entire community has a right to open and complete presentation of all data pertaining to aquatic plant control in those waters. We appeal to the Corps to provide just such a complete presentation. (29)

The draft EIS contains no information on chronic toxicity of the other chemicals proposed for use. There is little data available on them, with the exception of evidence that diquat produces severe human eye injury (Toxicology . . . 439; Cant, J. S. and Lewis, D. R. H., 1968a, Ocular damage due to paraquat and diquat, British Med. Journal 3, 59; Cant and Lewis, 1968b, Ocular damage due to paraquat and diquat, British Med. Journal 2, 224). (29)

One can easily see that none of these herbicides has been proven safe with regard to chronic toxicity. We are particularly opposed to 2,4-D since data are accumulating that implicate it as a carcinogen and a teratogen. Since other effective methods for controlling aquatic plants are available, we suggest that herbicides need not be used. (29)

Invertebrates in sediment absorb chemicals which are thereby introduced into the food chain. (29)

We are concerned about the drift of herbicides from the point of application into adjacent waters, especially into marsh areas, and about the retention of herbicides in the sediment. (29)

The draft EIS presents no data on how herbicides distribute in the water column. Nor is any data given on proposed concentration of herbicides or of safe use. (29)

We would like to emphasize that simply because chemicals are registered with the EPA does not mean they are guaranteed of safety. U.S. Senate hearings in 1976 bore out that the EPA has failed in its responsibility to the public regarding valid registration of toxic chemicals. 2,4-D was one of the "glaring examples" named in the hearing. EPA itself cites insufficient manpower, inadequately trained staff, and the lack of sound data as crippling problems. The continued argument that EPA registration denotes safety must be eliminated from future discussions of herbicide applications in the waters of this state.

- Summary of the EPA and the Regulation of Pesticides, Staff Report to the Subcommittee on Administrative Practice and Procedure of the Committee on the Judiciary of the U.S. Senate. December 1976.

- "Toxic Substances: EPA and OSHA are Reluctant Regulators." Science, Vol. 203, 5 January 1979.

- "EPA's Pestilential Oversight." Time, p. 64, 17 January 1977.

- "Upstairs, Downstairs at EPA." Audubon, March 1977, pp. 148-149. (29)

The draft EIS gives a totally inadequate treatment of the human health effects of the herbicides proposed for use. It provides virtually no information on both acute and chronic toxicity of the chemicals. (29)

The only piece of relevant data is the human LD_{50} for 2,4-D (page A-3). No comparable data is given for endothall, casoron, or diquat. All of the remaining tables are irrelevant with regard to humans, since one cannot extrapolate LD_{50} data from other species to humans. In addition, it is crucial to remember that an LD_{50} is only a statistical average. There is wide variation in individual susceptibility to a toxic substance; thus, there is no indication as to the danger to any one person. (29)

The METRO literature search on the public health effects of 2,4-D, endothall, diquat, and casoron is still in a draft form and, officially, the Corps does not have a copy of it. Through computer search, however, the Corps has had access to the studies noted in the METRO search. A comparison of bibliographies of the METRO search and the Corps' draft EIS indicates only one source listed by both. We strongly feel that the Corps must, in developing its final EIS (and developing its policy), consider the additional data alluded to in the METRO draft search. A policy as far reaching as the one about to be developed on aquatic plant control must take into consideration the latest research on chronic human health effects. Without these data, the final EIS would be deficient. (29)

Chronic effects of these herbicide compounds are only briefly mentioned (pages 58, 59, and A-2). In both cases, it is admitted that little is known about the long-term effects of 2,4-D, and that the subject is still highly controversial. Bearing this in mind, it is dangerous to assume that 2,4-D is safe simply because the information is not available. It would be far wiser to assume that it is hazardous until definitive tests have proven it otherwise. (29)

On page 59, it is stated that "there has never been any indication that 2,4-D, in concentrations used for aquatic plant control, would cause public health problems." It is an accepted policy by scientists that one cannot establish a "no-effect" level for carcinogenicity and teratogenicity. If a chemical exhibits these effects at high doses, some individuals may be susceptible even at lower doses. The above quote ignores these facts. Also, the quote overlooks two points. One, particularly pertinent to teratogenesis (birth defects), is the vast amounts of toxic substances in our manmade environment and their potential for cumulative effects. This makes it difficult to sort out which substances are causal and to understand the unknown/untested synergistic effects. In addition, it behooves us to reduce the use of toxic substances where an alternative exists. Secondly, after a 10- to 20-year latency period, it is difficult to PROVE conclusively that a chemical caused a cancer. Yet, in light of the scientific herbicide controversy, recent studies and anecdotal evidence to perpetuate the half-truth that positive human proof is lacking is, at best, uninformed. (29)

Contrary to the information in the draft EIS, there are several studies which suggest that 2,4-D may be carcinogenic (cancer causing), mutagenic (mutation causing), and teratogenic (birth defect causing). The Corps is referred to the previously mentioned METRO literature search conducted by Dr. Ruth Shearer for this information and for the appropriate references. (29)

The most recent study (Reuber, Melvin D., 1979, Carcinogenicity of 2,4-dichlorophenoxyacetic acid. Manuscript) suggests that 2,4-D is carcinogenic in rats (mammary gland and lymphoreticular system) and in mice (lymphoreticular system), and that this data is relevant to humans. 2,4-D has also shown positive results in several mutagenicity tests:

- Magnuson, J. et al., 1977, Mutagenic effects of chlorinated phenoxyacetic acids in Drosophila melanogaster. Hereditas 87, pp. 121-123.

- Ahmed, F. E. et al., 1977a, Pesticide induced DNA damage and its repair in cultured human cells. Mutation Research, 42, pp. 161-174.

- Hart, R. W. et al., 1977, In Vitro Assessment and Mechanism of Action of Environmental Pollutants. Annals of New York Acad. Sci. 298, pp. 141-158.

- Ahmed, F. E. et al., 1977b, Pesticide Induced Ouabain Resistant Mutants in Chinese Hamster V79 cells. Chem. Biol. Interactions 19, pp. 369-374. (29)

Studies have suggested that 2,4-D is teratogenic and fetotoxic in rats, mice, pigs, and hamsters. In light of the number of different mamalian species in which teratogenesis has been detected, there is cause for great concern that it is also teratogenic in humans.

RAT

- Khera, K. S. and W. P. McKinley, 1972., Pre and Postnatal Studies on 2,4,5-Trichlorophenoxyacetic Acid, 2,4-Dichlorophenoxyacetic Acid and Their Derivatives in Rats. Toxicology and Applied Pharmacology 22, pp. 14-28.

- Schweta, B. A., G. L. Sparschu, and P. J. Gehring, 1971, The Effects of 2,4-Dichlorophenoxyacetic Acid (2,4-D) and Esters of 2,4-D on Rat Embryonal, Foetal and Neonatal Growth and Development. Fd. Cosmet. Toxicol., 9, pp. 801-817.

- Aleksashina, Z. A. et al., 1973, Embryotoxic Action of the Diethylamine Salt of 2,4-D. Gigiena I Sanitariya, 2, pp. 100-101.

MICE

- Courtney, K. Diane, 1977, Prenatal Effects of Herbicides: Evaluation by the Prenatal Development Index, Arch. Environm. Contam. Toxicol., 6, pp. 33-46.

PIG

- Bjorklund, Nils-Erik and Kurt Erne, 1966, Toxicological Studies of Phenoxyacetic Herbicides in Animals, Acta vet. scand., 7, pp. 364-390.

HAMSTER

- Collins, T. F. X. and C. H. Williams, 1971, Teratogenic Studies with 2,4,5-T and 2,4-D in the Hamster, Environ. Contam. Toxicol., 6, pp. 559-567.

The draft EIS makes no mention of one breakdown product of 2,4-D, 2,4-Dichlorophenol (2,4-Dph) which has also been implicated as a carcinogen (Boutwell, R. K. and D. K. Bosch, 1959, The Tumor-Promoting Action of Phenol and Related Compounds for Mouse Skin, Cancer Research, 19, pp. 413-424). After the lesson on the toxicity of TCDD found in 2,4,5-T formulations, it would seem wise to pay attention to 2,4-Dph. (29)

One study suggests that 2,4-D and 2,4-Dph could act synergistically at very low levels to cause teratogenesis (Konstantinova, T. K. et al., 1976, The Embryotropic Effect of the Dissociation Products of Herbicides Based on 2,4-D, Gigiena I Sanitariya 11, pp. 102-1050). (29)

Recent research indicates the sediment as the primary deposition site of 2,4-D (MacKenzie et al., 1975. Final report of the Commisioners, Royal (Canadian) Commission of Inquiry into the Use of Pesticides and Herbicides). (29)

The Department of Game has expressed concern about the use of herbicides, especially 2,4-D, on wetlands and spawning and rearing sites for salmonids and spiney-rayed fishes, an area which would include most or all of the proposed use locations. (29)

The State Department of Fisheries states that it "cannot support the use of 2,4-D to treat milfoil when salmon are present in the treated areas until we have seen data on the effects of the specific chemical proposed for use on different types of salmon; i.e., both fry and fingerlings" (draft EIS, page B15, paragraph 2). If the most effective application time for herbicides coincides with the spawning season, then the herbicide application time would have to be delayed, thereby reducing effectiveness of the chemical. This is an important added reason to opt for a nonchemical solution to milfoil control. (29)

The draft EIS lacks information on sublethal toxicity which is often seen at doses significantly below those that cause death. Humans exposed to 2,4-D have experienced headaches, dizziness, nausea, vomiting, and muscular weakness (Caserett, L. D. and Doull, J. D., 1975, Toxicology, pp. 437-438). Also, several cases of peripheral neuropathy have been reported (Goldstein, N. P. et al., 1959, Perpheral Neuropathy After Exposure to an Ester of Dichlorophenoxyacetic Acid, J. Amer. Med. Assoc., 171, pp. 1306-1309; and Berkley, M. C. and K. R. Magee, 1963, Neuropathy Following Exposure to a Dimethylamine Salt of 2,4-D, Arch. of Int. Med. 111, pp. 351-352). We believe that the public should be warned of these symptoms, since there is chance of exposure following any spraying. (29)

The draft EIS fails to adequately outline 2,4-D's predicted efficacy over the long term. Since the proposed treatment areas are limited, why wouldn't recolonization from adjacent areas result in rapid regrowth? If so, how often would the areas require retreatment? Largely absent from the draft EIS are references to studies on the toxicity and carcinogenicity of 2,4-D to waterfowl, fish, and other aquatic organisms. Nor does the draft EIS deal adequately with the hazards of drift of 2,4-D and other herbicides in the aquatic environment. How are wetlands and other ecologically sensitive areas in, or adjacent to, the treatment areas to be protected from toxic effects? We are concerned that the use of 2,4-D and other herbicides, as proposed in the draft EIS, may present an unnecessary and unacceptable risk to the health of local aquatic ecosystems and thus, we feel that it should not be utilized. (30)

The EIS's information on toxicity of the proposed chemicals, particularly 2,4-D, is inadequate. While the exact impact of 2,4-D on

humans and wildlife is still debated, there is a growing body of evidence which suggests it is both carcinogenic and teratogenic. We direct your attention specifically to a 1979 study done by Alvin Reuber at the National Cancer Institute. The EIS itself states (page A-2) that long-term impacts of low concentrations of 2,4-D are not known. The implication on page 59 that these chemicals are safe in the amounts used for aquatic plant control should be removed from the final EIS. Both the National Academy of Sciences and the Surgeon General have stated that there is no threshold level for toxic chemicals. Any amount should be considered dangerous. Chemicals should not be considered innocent until proven guilty. Given the uncertainties surrounding the safety of the proposed chemicals, the Corps should show extreme hesitation in sanctioning their release into public waters when alternate methods are possible. (33)

A nonchemical approach to the problem of milfoil infestation would be preferred. The herbicide 2,4-D seems to have adverse health effects, the full range of which are not yet delineated. The level of 2,4-D application proposed by the Corps is too great relative to our knowledge of the effects of this chemical on humans and wildlife. (33)

I would like to put on notice that my wife and I, and also my neighbors, get water out of Lake Sammamish for domestic water supply, and we are very concerned about the possibility of the use of herbicides in Lake Sammamish and their effect on our water supply and our health. (34)

We, therefore, are very strongly opposed to the use of any herbicides in Lake Sammamish. (34)

Several important statements are made in the draft EIS for which no basis of support is given. 40 CFR 1502.24 states that agencies shall make explicit reference to the scientific and other sources relied upon for conclusions in the EIS. On page 56, section 4.06.5.1, the Corps of Engineers concludes that no fish kills, due to the toxicity of 2,4-D, would be expected at the concentrations used to control Eurasian watermilfoil. The data listed in appendix A of the draft EIS, representing the acute toxicity of 2,4-D to fish, does not include important species which are indigenous to Washington and, therefore, cannot be used to support the conclusion. It is generally recognized that the toxicity of 2,4-D to salmonids has not been adequately tested, and the data presented in appendix A confirms this. (35)

Claims made that fish avoid areas treated with 2,4-D and that the impact to aquatic organisms would be minimized by timing the herbicide applications are unsubstantiated, and we question the effectiveness of herbicide application timing because of the overlap of salmon migrations, the persistence of 2,4-D, and the susceptibility of 2,4-D to drift. It should be noted that the Aqua-Kleen label states that fish and other aquatic organisms may be killed at application rates recommended on the label. Aqua-Kleen is a granular herbicide product containing 2,4-D BEE. (35)

The Corps of Engineers states on page A-2 of the draft EIS that many scientific studies of the chronic health effects of 2,4-D have been done, but the results have thus far been inconclusive. According to Dr. Ruth Shearer, who has conducted a comprehensive search of the worldwide literature relating to the effects on the public health of using 2,4-D, endothall, diquat, and dichlobenil, only three laboratory studies of the carcinogenicity of 2,4-D or its derivatives appear in the scientific literature, and none of these tests meet modern environmental toxicology standards. On page 59, section 4.08.2, the Corps of Engineers concludes that there has never been any indication that 2,4-D, in concentrations used for aquatic plant control, would cause public health problems. Both the Seattle Water Department and King County have recently examined the public health aspects of 2,4-D use, and each arrived at quite different conclusions. They determined that:

1. with existing information, there is still a reasonable doubt as to some possible long-range health ramifications;

2. the effects of long-term human exposure have not been conclusively established; and

3. the alleged risks of using 2,4-D are sufficiently serious to preclude its use. (35)

The Seattle Water Department and King County have established moratoriums on the use of 2,4-D in areas under their jurisdiction. Both of these agencies examined the toxicological data and determined that 2,4-D has not been proven safe and, therefore, should not be used. The Corps of Engineers examined the toxicological data and determined that 2,4-D has not been proven hazardous and, therefore, should be considered for use. We are very disturbed by the Corps of Engineers' attitude toward potential health hazards and feel that the decision to use herbicides was not made in the public's best interest. If there was a clear and overwhelming benefit associated with herbicide use, then the Corps' position might be justified. However, the use of herbicides to control Eurasian watermilfoil will result merely in "chemical" mowing at a cost not significantly below that of mechanical harvesting. 2,4-D is currently on the EPA's pre-RPAR (Rebuttable Presumption Against Registration) list, and if placed in RPAR status, 2,4-D will for the first time receive a thorough review. Until this occurs, we feel that 2,4-D should not be used if acceptable alternatives exist. We urge the Corps of Engineers to reconsider its support for the herbicides 2,4-D, endothall, diquat, and dichlobenil. (35)

<u>Sections 1.04.5, 1.06.1, 1.06.2, 2.03.7, and 4.04.5.1</u> - These sections address the suitability and efficacy of the use of 2,4-D for control of watermilfoil, recommendations that it be used for spot treatment in Lake Osoyoos and the Okanogan River, and the necessity

that precautions be taken to prevent contamination of water used for irrigation. The Oroville-Tonasket Irrigation District, which is contractually associated with the Bureau of Reclamation, has two pump intakes from Lake Osoyoos and six from the Okanogan River. (36)

The Bureau of Reclamation recommends that no 2,4-D treatments be made within one-half mile of the irrigation water intakes on Lake Osoyoos to minimize any potential for contamination by 2,4-D residues. A water sampling and analysis program should be instituted in connection with any treatments made in order to obtain information on the levels of residues and their persistence and fate. When adequate data has been accumulated to show that probable levels from operational treatments are within acceptable tolerances, the distance restriction could be reduced or dropped. (36)

The Bureau of Reclamation further recommends that no 2,4-D treatments be made in the Okanogan River until data from the residue work in Lake Osoyoos is available and sufficient study is made of the river to predict probable levels and behavior of residues. (36)

The Yakima County Audubon Society, with a membership of 235 persons, would strongly recommend that you defer the use of chemicals such as 2,4-D or its derivatives in the proposed milfoil control program. We believe that the possible long-range effects of such chemical applications, particularly to the state's water resources, could prove to be a costly and even dangerous mistake. (37)

We do urge that a comprehensive program of mechanical controls be given a thorough test before other methods of control are considered. (37)

Appendix A, table 1, lists acute toxicity values and references for a number of species tested. However, there is a noticeable paucity of local species. Similar information concerning carcinogenicity, teratogenicity, mutagenicity, and developmental toxicity effects of the subject herbicides were not included. (38)

Response: The Corps' Aquatic Plant Management Program provides the state and participating local jurisdictions the opportunity to select which method, or combination of methods, is to be used.

All chemicals included in the program (2,4-D, diquat, endothall, and dichlobenil) must be, and are, legally available for the intended use; i.e., they must be registered by EPA and the Washington State Department of Agriculture for the control of aquatic plants.

EPA is in the process of evaluating those chemicals registered for use prior to the enactment of the Federal Insecticide, Fungicide, and Rodenticide Act of 1972 to determine if they should be reregistered. The chemicals acceptable for use as prescribed in the Corps' program have not been evaluated by EPA for reregistration. Upon reevaluation, should EPA not reregister one or more of the chemicals, the

chemical(s) would be deleted from the Corps' program. Additionally, should the monitoring and evaluation of the program, or the research being done by the Corps' Waterways Experimental Station, or by others, indicate unacceptable adverse effects from the use of any of the program alternatives, those alternatives would be modified or deleted.

Annual reevaluation of the program will allow for incorporation of site-specific and species-specific information into the operation. No specific bioassays are planned as a part of the management program.

Much of the literature cited on environmental impacts of 2,4-D is based on species which are not native to the northwest. We realize that these studies are not totally applicable to northwest environment, but they do provide significant insight on the environment effects of 2,4-D.

The final EIS has been revised to include additional information on chemical monitoring, drift, chemical application procedures, water quality, public health concerns, impacts to the ecosystem, bioaccumulation, breakdown products, and persistence (refer to chapters 1, 4 and appendix C). The final bibliography includes additional documentation.

9.09.6 <u>Comment-Response Category 6 - Economic Analysis</u>.

<u>Comments</u>: <u>Pages 28 and 29</u> - The purported "benefit/cost analysis" presented in the draft EIS presents a completely unsupported assertion rather than an analysis. Neither benefits nor costs are quantified in any detail and no information to support the figures presented is given. On the surface the figures given and the ratio listed are ludicrous. According to the draft EIS, the benefits are calculated as "the cost of the most likely, least cost alternative that land owners would invest in, in the absence of a Federal program." Presumably, the benefits are given as an annual figure so that they would be comparable to the annual cost of the program. How then were benefits of $55,100 arrived at for the Madrona, Seward, and Pritchard Parks areas, for example. These areas are identified as totalling 2 acres. Assuming a cost of $6,000 per acre for bottom screening, the total cost would be $12,000 and that cost would be prorated over the estimated 10-year plus life of the material (i.e., a crude estimate of $1,200 per year). The high benefits are identified for the public beaches and the clearing of boat lanes for shoreline residents and yacht clubs is pegged at $300 per acre (the approximate figure for one herbicide treatment or two or more mechanical harvestings). For further example, how were benefits of $747,500 arrived at for control of less than 2 acres at Lake Sammamish State Park which don't even need to be controlled? What control alternative costs in excess of $373,750 per acre? Using the figures in the draft EIS and assuming the high number of 91 acres (which includes unidentified acreage), the draft EIS indicates benefits of $10,215 per acre. What alternative costs that much per year? Using the figures in the draft EIS for proposed project costs (144,000), the per acre figure would be $1,582 (over an order of magnitude more expensive than estimated

costs for one mechanical harvesting treatment). Costs for the proposed project seem to be grossly inflated, although not nearly as inflated as assumed benefits. (9)

Page 30 - Similar comments would seem to be pertinent with respect to the "benefit/cost analysis" of the proposed prevention program. No information to support the numbers presented in the draft EIS is given. Figures are merely listed. (9)

The "benefit/cost analysis" presented in the draft EIS is totally unsubstantiated within the document. Using the same method of analysis suggested by the draft EIS, the benefit/cost ratio actually is approximately 0.2 rather than the 6.5 stated in the draft EIS for the proposed Seattle area control program. Such a low ratio is far less than the break even point of 1.0 and underscores the lack of economic justification for the proposed program. (9)

The discussion of 2,4-D as a control method is completely lacking in information with which to evaluate its costs and benefits. (30)

We would also like a more detailed cost-benefit analysis presented in the final EIS. We would particularly want to point out that a cost not identified in your analysis would include the money spent to prevent chemical applications in Lake Washington. If the cost to a private landowner for spraying is an identified benefit of the program, then it should follow that the costs incurred by public nonprofit community organizations to prevent herbicide application would have to be identified as a cost of your program. (33)

The present assessment of costs, given as $144,000 for a combination of the proposed methods, seems to indicate nothing other than direct costs for application of the proposed methods. The analysis should recognize that indirect costs may be involved with usage of a particular control method. For example, the use of herbicides and harvesting may result in lowered dissolved oxygen levels which may kill some of the fish population. Any chemical hazards to the fish population must involve some cost to the public. Although we recognize that these costs are difficult to quantify, we feel that they should be at least qualitatively assessed and discussed in the final EIS. (18)

How were the dollar benefits of the program determined for the public areas as listed in paragraph 1.05.4? (19)

Page 28, Section 1.05.4 - Benefit/cost analysis of the control program contains a sentence which summarizes the prime reason for the 2,4-D treatment: "Therefore, the cost of the most likely, least cost alternative that landowners would invest in, in the absence of a Federal program that would provide the same level of control, are considered to the benefits for the nonpublic areas." Because landowners would rather invest in the cheapest available means of milfoil control is no reason to recommend herbicides for milfoil treatment. (27)

To have milfoil in the water is a nuisance, but not a direct threat to life or livelihood. To justify control, especially chemical control with its inherent risks, on the basis of economics does not follow (refer to Benefit/Cost Analysis, section 1.05.4). (29)

The bulk (almost the entire) of the areas involved would appear to be boat lanes for the benefit of private residences or private yacht clubs rather than the public as a whole. (9)

The apparent disproportionate benefits attributed to Lake Sammamish State Park on page 29 should be better explained. Are benefits based primarily on quantity of visitor use, and is use at Lake Sammamish that much higher than other areas? Use figures would be helpful. (20)

The benefits of treatment in all of Lake Washington total $182,100; for Lake Sammamish, the total benefits are listed at $747,500. It would seem that there should be some explanation as to why the recreational benefits of treatment in Lake Sammamish are four times greater than all of Lake Washington. (21)

We also note that identified benefits at the table on the State Park from milfoil control is the major benefit as shown on page 29 ($747,500 or 80.4 percent of total Lake Washington-Sammamish Federal Program). Since only 2 to 4 acres are involved, we would be interested in learning the costs for control by shading on an annual basis. (24)

<u>Section 1.05.4</u> - We suggest that the cost/benefit analysis discussion be expanded substantially to allow an evaluation of the various alternative methods of control. The estimate of benefits seems to be based upon what a few property owners are willing to pay for the "most likely least cost alternative;" namely, herbicide application. Since that method was the most readily available and convenient, as well as the cheapest, the fact that without chemicals being allowed, property owners may have been willing to pay more for different approaches to milfoil control seems to have been overlooked. Though the difference cannot be easily quantified, it should be acknowledged qualitatively in the final EIS. (18)

<u>Response</u>: A complete benefit-cost analysis for the program (control and prevention) has been included in chapter 1, and appendixes A and B, of the final EIS. The purpose of the analysis is to identify economic benefits associated with the program and the costs that would be incurred by local government administration, Washington Department of Ecology, and the Corps' management costs. Costs incurred by groups opposing the program, or any part of the program (i.e., chemical application), are not relevant to whether or not the Aquatic Plant Management Program is economically justified.

Only recreation benefits are being used in the benefit-cost analysis. Recreation benefits are based on the following assumptions:

• Recreation losses are claimed only for the three summer months of June, July, and August, during which beaches are officially open for swimming.

• An estimated 50 percent loss in swimming opportunity will occur.

• An estimated 35 percent loss in beach activity will occur.

The dollar value of recreation loss for public beach areas was calculated by multiplying the combined loss by a unit day value of $2 per lost visitor day for the control program areas and $1.75 per lost visitor day for the prevention program area.

The boating benefits are derived from the "willingness to pay" concept and are based upon the willingness of waterfront property owners to assume the expense of treating milfoil in the navigable public waters fronting their property. While these areas are not adjacent to publicly owned lands, they are public waters and available for activities such as swimming, water-skiing, fishing, and boating by the general public. The value of the boating benefits is obtained by the estimated cost of the treatment method that property owners would be willing to pay in the absence of any other program. Therefore, the benefits were either the cost of the lowest cost alternative or of the highest cost alternative. We selected the lowest more conservative value for inclusion in the benefit analysis.

Seven waterfront parks within the Lake Washington-Lake Sammamish system have been identified as having milfoil infestations, and are included in the areas of the proposed 1980 control program. The swimming and beach activity at Lake Sammamish State Park is much greater than any of the other six parks (see appendix B, table B-1). Accordingly, the benefits from control of milfoil at that park are far greater.

The use of the term "least costly alternative" was used in the draft EIS solely from an economic standpoint. It does not imply the Corps favors one alternative treatment method over another. Any of the treatment methods in the proposed program are acceptable for use.

9.09.7 Comment-Response Category 7 - Design Memorandum.

Comments: I would greatly appreciate a copy of the design memorandum (DM). The draft environmental impact statement (EIS) frequently refers the reader to the DM for more detailed and specific data or explanations concerning major elements of the proposed control program and its impacts. The DM is not included with the draft EIS and it is our understanding from discussions with Corps of Engineers' staff that it will not be available for public review prior to the end of the public review period on the draft EIS. However, review of the DM is necessary to more clearly understand such elements of the program as the basis for the cost-benefit analysis, the process proposed for selection of control methodologies, the criteria proposed

for selection of control areas, and the proposed system for prioritization and funding of site-specific control programs in subsequent years. We anticipate being able to make more specific comments on the program upon receipt of the DM. (6)

According to the draft EIS, some discussion of the benefit-cost methodology is presented in a DM prepared by your office. If so, that document should have been appended to the draft EIS. (9)

Because there is no explanation of how the benefit-cost analyses were determined, we cannot accept them. We were promised a copy of the DM; however, at this writing, it has not been received. We strongly request that the final EIS itself contain detailed figures and explanations of computations, including actual researched costs of all proposed control methods. (29)

The cost/benefit analysis hardly deserves the name, it is so lacking in substance. We are told that more data is contained in the DM, but this document was not available to the public for review during this comment period. How are citizens and elected officials to make competent choices when the information they need on which to base those choices is not available? The handling of a review process in this fashion seems to us to be not in keeping with either the letter or intent of the Clean Water Act and its public participation requirements. (30)

No information is presented in the draft EIS which would explain how the costs and benefits of the Aquatic Plant Management Program were determined (pages 28 and 29, section 1.05.4 and page 30, section 1.06.4). Instead, we are referred to the state design memorandum which has not yet been released to the public. The regulation 40 CFR 1502.21 states that no material may be incorporated by reference into the EIS unless it is reasonably available for inspection by potentially interested persons within the time required for comment. The benefit-cost analysis for the Aquatic Plant Management Program deserves public review and comment, but this was not possible because of the lack of information presented in the draft EIS. A detailed discussion of the methodology and derivation of the benefits and costs should have been included as an appendix to the draft EIS. Since this was not done, we request that a formal public comment period be established for the DM. (35)

We look forward to a more thorough review of the program upon receipt of the DM, which we hope will help us better understand the cost/benefit analysis, criteria for selecting control methodologies, and areas of application, and the constraints on local sponsorship. In addition, further review will result from management analysis conducted through the Union Bay Milfoil Demonstration Project in which King County is participating. (38)

Response: A copy of the DM was provided those specifically requesting one to complete review of the draft EIS, and an additional 10

days were granted for them to finish review of the EIS. Comments received during that period are responded to in this comment-response section. In addition, chapter 1 of the final EIS has been expanded to address in more detail the basis for the benefit-cost analysis, the process proposed for selection of control methodologies, the criteria proposed for selection of control areas, and the system for prioritization and funding of site-specific control programs in subsequent years. Additionally, a complete cost and benefit analysis for the program has been included in appendixes A and B of the final EIS.

9.09.8 Comment-Response Category 8 - Comments Not Categorized.

Comment: We request that the EIS comment period be extended until 14 September 1979. (2)

Response: The requested extension was granted.

Comment: The Okanogan County Department of Public Works supports the proposed action as defined in the draft environmental impact statement. It would appear that a combination of chemical and physical control measures based on our current experience would be the most cost effective and environmentally acceptable methods available. (3)

Response: Your comments are noted.

Comment: What is the definition of "navigable waters" (as defined in Corps regulations)? (5)

Response: Navigable waters of the United States, as defined in Corps of Engineers regulations, are " . . . those waters of the United States that are subject to the ebb and flow of the tide shoreward to the mean high water mark and/or are presently used, or have been used in the past, or may be susceptible to use to transport interstate or foreign commerce."

Comment: We do not anticipate adverse impacts to our wastewater facilities or public transportation system as a result of this proposal. (6)

Response: Your comment is noted.

Comment: According to the DEIS, the local agencies would propose specific sites and methodologies for control of milfoil and submit those programs to the Department of Ecology. An attachment is provided with this letter which outlines the decisionmaking strategy and time frames for the completion of the Union Bay Demonstration Study, including selection of a local sponsoring agency and control methodology for Union Bay of Lake Washington. According to this draft schedule, submittal to DOE for funding under the COE program could occur by January 1980, and we anticipate this would allow sufficient time for consideration of the submittal by both DOE and COE.

UNION BAY DEMONSTRATION PROJECT
DECISIONMAKING STRATEGY AND TIME FRAMES
(For the period July 1979 - April 1980)

TASK	TARGET DATE
1. Corps of Engineers released draft EIS for statewide control program.	July 17
2. Results of herbicide literature study available.	
- Medical	August
- Aquatic environment	August
3. Comments due back to Corps.	August 31
4. Second harvest of Union Bay Study.	Early September
5. Identify relationships between management/ financial alternatives and control techniques.	September 15
6. Receive final assessment of alternative control techniques.	October 1
7. Submit analysis of alternatives to Water Quality Committee on local sponsoring agency and control methodology.	October 31
8. Water Quality Committee recommendation.	November 29
9. METRO Council considers recommendation.	December 6
10. METRO Council decision.	December 31
11. Local agency accepts lead role (will need to go through SEPA).	January 1, 1980
12. Lead agency applies for Corps funds.	January 1980
13. Lead agency may contract for or buy any equipment, supplies, services that will be needed.	
14. Lead agency starts any permit processes necessary.	February 1980
15. Local agency action on milfoil.	April 1980 (6)

Response: Your schedule corresponds with the scheduling for implementation of our proposed program.

Comment: The Corps of Engineers is reminded that, if the proposed undertaking will affect properties included in or eligible for inclusion in the National Register of Historic Places, it is required by Section 106 of the National Historic Preservation Act of 1966 (16 U.S.C. Section 470f, as amended, 90 Stat. 1320) to afford the Council

an opportunity to comment on the undertaking prior to the approval of the expenditure of any Federal funds or prior to the issuance of any license. The Council's regulations, "Protection of Historic and Cultural Properties" (36 CFR Part 800.4) detail the steps an agency is to follow in requesting Council comment.

Generally, the Council considers environmental evaluations to be adequate when they contain evidence of compliance with Section 106 of the National Historic Preservation Act, as amended. The environmental documentation must demonstrate that either of the following conditions exists:

a. No properties included in or that may be eligible for inclusion in the National Register are located within the area of environmental impact, and the undertaking will not affect any such property. In making this determination, the Council requires:

(1) evidence that the agency has consulted the latest edition of the National Register (Federal Register, 6 February 1979, and its monthly supplements); and

(2) evidence of an effort to insure the identification of properties eligible for inclusion in the National Register, including evidence of contact with the State Historic Preservation Officer, whose comments should be included in the final environmental statement.

b. Properties included in or that may be eligible for inclusion in the National Register are located within the area of environmental impact, and the undertaking will or will not affect any such property. In cases where there will be an affect, the final environmental statement should contain evidence of compliance with Section 106 of the National Historic Preservation Act through the Council's regulations, "Protection of Historic and Cultural Properties." (7)

Response: Although the proposed program is statewide in scope, we anticipate no adverse impacts to cultural resources. The nature of the work is such that any cultural resource sites would not be disturbed. Comments from the State Historic Preservation Officer are included in this comment-response section.

Comment: Due to the refusal of your office to provide access to the draft EIS and/or earlier versions of the draft EIS when requested in June 1979 and subsequent time and location constraints on my part, these comments will be fairly general in nature and, for the most part, will not include specific reference citations. However, a sample of citations was included with the comments which I wrote for Friends of the Earth regarding the draft EIS of the Washington Department of Ecology for watermilfoil control in Lake Washington circa 18 April 1979. Your office has a copy of those comments and it is requested that they be attached to this letter as a part of my comments on this draft EIS. (9)

Response: We have attached the letter as requested; however, we have not specifically addressed it because the comments are in response to the draft environmental impact statement released by the State of Washington.

Comment: In general, the draft EIS is inadequate as a document from which to make an informed decision regarding the topic matter. Important relevant information is not included in the draft EIS and some of the information which is included is presented in such a way that it is evident the prejudgment has biased the writing (either consciously or unconsciously) in the direction of favoring previously stated Corps policy. (9)

Response: We have included additional information on costs, benefits, monitoring, and the effects of chemicals in the final EIS text and appendices. We are not aware of what previously stated policy you are referring to, but every effort has been made to present information regarding the proposed Aquatic Plant Management Program in an objective manner.

Comment: Title page - The names of the authors and their qualifications are missing. They should be included so that the authors may be held professionally accountable for the quality (or lack of quality) of their work. (9)

40 CFR 1502.17 requires that the names and qualifications of the principal authors of the EIS be listed. (35)

Response: Because the draft EIS was prepared and filed prior to implementation of the new CEQ regulations, no list of preparers was required. The following Seattle District, Corps of Engineers personnel were primarily responsible for preparing the draft EIS: Bob Rawson (EIS Coordinator), Biologist; Tim Redden, Biology Aide; James Smith, Economist; and Steven Babcock, Recreation Resource Planner. In addition, analysis of milfoil impacts to recreation and land values was done by Lenja Gould, Urban Planner, Northwest American.

Comment: Page i - Although noise and air quality effects are listed as adverse consequences of mechanical control methods, the similar adverse effects that would accompany increased powerboat usage projected as a project result are not mentioned. They should be. Increased powerboat usage also means increased pollution due to the accompanying waste and pollutant discharges and increased energy consumption for nonessential (i.e., recreational) purposes during a time of national energy shortages. (9)

Response: The proposed program is not expected to increase powerboat usage, but to prevent the loss of present recreational boating opportunities.

Comment: Page i - The alternative evaluated purportedly included other chemicals such as "silvex." It is suggested that confusion could be avoided, and it would be more technically correct, if all chemicals were referred to by their chemical names rather than trade names (unless a specific product is being endorsed). Furthermore, 2,4,5-TP was suspended for such uses by emergency order of the U.S.

Environmental Protection Agency (EPA) late this winter as an "imminent hazard" to human health. (9)

Response: Silvex is the common name for the chemical 2- (2,4,5-trichlorophenoxy) propionic acid. It is not a trade name. Silvex had already been eliminated from our program for environmental reasons when it was officially banned by EPA. Paragraph 6.01.4 of the final EIS has been revised to indicate its present status.

Comment: 2,4-D might result in some kill of root systems; the expected kill in open-water systems is significantly less than 100 percent, and grow back could be expected relatively rapidly. What is the Corps' definition of "complete control?" (9)

Response: It is not known what percent of milfoil roots would be killed, but it is assumed that because of its systemic action, there will be more root kill than with contact herbicides. The extent of root kill will be evaluated as part of the proposed program. "Complete control," as used in the draft EIS, means the elimination of all milfoil plants, including the root systems.

Comment: The word "infested" is utilized to describe the occurrence of Eurasian watermilfoil growth. This is a value laden word that is inappropriate for use in a technical document unless bias is intended. (9)

Response: To infest means to spread in or over in a troublesome manner. In areas where milfoil has been identified as a problem, we have maintained the use of "infested" in the final EIS; when we are talking about milfoil growth in general terms, we have substituted the word "inhabited" or "occurred" throughout the final EIS.

Comment: Reference is made to Reed (1977) that Eurasian watermilfoil may form "extensive mats on the water surface." Whereas, this may or may not occur in other areas and it is certainly less likely to occur in an area where water level fluctuations are minor, it is somewhat misleading to include such a statement without indicating whether or not such a phenomena occurs in the State of Washington. Biologists have noted a lack of such mats in the Seattle area. (9)

Response: Surface matting may occur from both rooted plants and floating plant fragments. Western Washington may not be the optimum habitat for milfoil but matting from rooted plants is known to occur in shallow areas. The matting of floating milfoil fragments is common in the Seattle area.

Comment: Pages 1 and 2 - It is stated that M. exalbescens differs "significantly" from M. spicatum, yet it is also stated that "similarity" between the two has resulted in taxonomic confusion. The draft EIS fails to specifically identify what if any, important differences there are between the two in terms of the need for control measures for one but not for the other. (9)

Response: The classic forms of M. exalbescens and M. spicatum are significantly different. Differing environmental conditions cause subtle changes in species morphology and the difference between the species can become almost indistinguisable to the layman. The main difference in Washington State is that M. exalbescens is a native species in natural balance in the aquatic environment while M. spicatum is an introduced species that tends to upset the natural balance of the aquatic ecosystem by outcompeting native plant species.

Comment: Page 2 - It is stated that the spread of Eurasian watermilfoil "is thought" to have been aided by "aquarium trade" and by "waterfowl movement." Both of these methods of spread are indicative of beneficial aspects of Eurasian watermilfoil (i.e., the esthetic beauty of the plant that makes it attractive to aquarium owners and its value as food for waterfowl). These benefits of the plant should be credited in the draft EIS and considered in relevant decision-making. (9)

Response: The use of milfoil by waterfowl was noted in the draft EIS, paragraph 1.03.4. The esthetic beauty of a few plants in a controlled environment such as an aquarium is quite different from the negative esthetic impacts caused by uncontrolled growth of milfoil in Seattle area lakes.

Comment: It would appear to be likely that Eurasian watermilfoil occurred in the Seattle area (and possibly elsewhere in Washington) considerably prior to the 1974 date indicated in the draft EIS. Watermilfoil-like plants were noted in Lake Washington in the 1930's and Eurasian watermilfoil is known to have occurred in British Columbia prior to that time. Furthermore, the level of plant occurrence in Union Bay was high enough by 1975 to generate significant complaints from recreational boaters. It is unlikely that such a level of growth occurred in less than 1 year. Watermilfoil is widely distributed in northwest states and has been for some time. Due to taxonomic confusion, it cannot be definitively stated whether or not the watermilfoil seen in past accounts is M. exalbescens or M. spicatum. (9)

Response: We agree that Eurasian milfoil was probably present in Washington lakes for some period of time before it reached problem proportions. The exact time of introduction is impossible to establish from historical reports due to the confusion between the two species.

Comment: Watermilfoil has been found in a number of areas besides those indicated on figures 1, 2, and 3 in the State of Washington. Failure to acknowledge such occurrence may give rise to an artificially created impression of rapid expansion of occurrence which is merely the result of looking for something not looked for before. (9)

Response: Revisions have been made to figure 3 in the final EIS to show additional areas where milfoil is known to occur. Efforts are made to verify local reports of milfoil populations in new areas.

Many of these reports have resulted in the identification of various native species and some have resulted in additions to our list of affected areas.

Comment: Page 6 - Grazing by snails in British Columbia is mentioned by reference to an unpublished Ministry of the Environment document (Kangasniemi, 1978). However, the significance of such grazing as a control method applicable to Washington is not dealt with in the draft EIS. Why not? (9)

Response: The memorandum by Kangasniemi was a preliminary observation report. Further study is needed to determine what possibilities exist for utilization of the snail for biological control.

Comment: Page 7 - In addition to the beneficial aspects of aquatic vegetation listed on page 2 that would apply to Eurasian watermilfoil, the draft EIS notes correctly on page 7 that Eurasian watermilfoil is "an important food source for some species of overwintering waterfowl" and that "one clear value of milfoil growth . . . is that it enhances sport fishing." These are important benefits. (9)

Response: The use of milfoil by waterfowl was noted in paragraph 1.03.4 of the draft EIS. As also stated in the draft EIS, the value of milfoil to fish is disputed. Thompson and Hartwig (1973) and Frye (1972) reported that milfoil populations provide shelter for small fish to the extent that predation is reduced to a level that the growth of the predator (game fish) is stunted.

Comment: Page 11 - What is the basis for the estimate of possible acreage that might be impacted by Eurasian watermilfoil in the event of spread in the Columbia River system? (9)

Response: As stated in the draft EIS, the parameters used to establish potential in the Columbia River were light penetration, water quality, and sediment characteristics. A field team from the Corps' Waterways Experiment Station recorded dissolved oxygen, pH, temperature, and Secchi disk readings at the sampling sites. Water samples were analyzed for total nitrogen, total phosphorous, alkalinity, and hardness. Salinity was determined for samples taken near the mouth of the Columbia River. Hydrosoil samples were analyzed for total carbon and particle size. This information, along with the calculation of the light compensation point (the amount of light required by a plant to fix enough energy through photosynthesis to balance the energy lost through respiration and thus to maintain itself) of milfoil for each water body, was used to estimate the total area which could support milfoil.

Comment: Page 11 - It is stated that harvesting might increase the spread of Eurasian watermilfoil by fragmentation. Is spread a problem of concern in the Seattle area where occurrence is already wide

in the interconnected system including Lake Washington by natural fragmentation? A number of biologists have stated that natural fragmentation exceeds whatever fragmentation may occur by harvesting operations. If so, this purported drawback of harvesting would seem to be inconsequential. (9)

Response: Fragmentation caused by mechanical harvesting would not represent a significant problem in infested lakes which do not have a direct flow into uninfested waters. In lakes which do have a direct flow into uninfested waters, such as Osoyoos Lake on the upper Okanogan River, mechanical harvesting would aggravate the downstream spread.

Comment: Page 12 - As indicated on page 12, hand removal "can be used to clear around private piers" and in fact that has been done successfully by Lake Washington shoreline residents with a minor expenditure of personal time. The bulk of the complaints from recreational boaters and shoreline property owners might, in fact, be adequately resolved by such a method if such people were willing to spend a little time and energy of their own solving their problems rather than demanding that government do it for them. Furthermore, the exercise would be a healthy side benefit. (9)

Response: Hand removal is feasible for only very small areas in shallow water. The areas around piers are not included in the proposed program. Most proposed treatment areas begin at the pierhead line and extend 100 feet into open public water. These areas are too large and too deep to be controlled by hand removal.

Comment: Page 14 - It is indicated that aerial surveillance would be used to monitor the spread of Eurasian watermilfoil. Precisely how would this be done and has any such surveillance been done to date? If so, what were the results? If not, why not? (9)

Response: To date, only experimental flights by the Corps of Engineers, using various film types and filters and flying at varying altitudes, have been done. These tests are part of our ongoing aquatic plant management research effort and will establish the best methods to use for aerial surveillance and give a good idea on what size milfoil colonies could be identified from these photographs. The Waterways Experiment Station is evaluating these test results. Future annual flights within the State of Washington will make use of the methodologies found to be most effective for identifying milfoil from aerial photographs. Specifically, the areas where aerial surveillance will be maintained include bodies of water, such as the Columbia River reservoirs, that are subject to milfoil fragment flow from infested areas upstream.

Comment: Page 15 - It is correctly noted on page 15 that eradication programs have been unsuccessful elsewhere and, therefore, "would not be attempted here." (9)

Response: This is true for large bodies of water with well-established milfoil populations such as Lakes Washington and Sammamish.

Comment: Waverly Park is not identified in the written text or on a figure. No figure is included for Lake Sammamish. For Seward, Madrona, and Pritchard Parks, no mention is made of the ongoing city of Seattle program using bottom screens. Neither are those parks identified on a figure. (9)

The city of Seattle has already acted to utilize bottom screening techniques for any aquatic plant problems (such as water lillies) that might exist at its beaches. Although the relevant portions of the METRO demonstration project have not yet been published it is known that bottom screening was highly satisfactory at those beaches during 1979, their first year of use (Personal communications with Dr. M. Perkins, University of Washington, Principal Investigator for the METRO sponsored study, October 1979). (39)

Response: Seward, Madrona, and Pritchard Island Parks are shown on figure 4 of the EIS. Waverly Park has been added to figures 4 and 8 and discussed in paragraph 1.06.1.4 of the text. Two figures (figures 4A and 12A) have been included for Lake Sammamish in the final EIS. At the time of writing, the Seattle Parks Department did not have any bottom screens in use. Their program has been noted in paragraphs 1.04.6 and 3.05 of the final EIS.

Comment: On page i of the draft EIS, it is indicated that the control program proposed would be for an area totaling 91 acres. Adding up the individual figures for the identified areas from the text (excluding Waverly Park which is not identified), a total of 86 acres is identified as a maximum. (Lake Sammamish State Park is identified as being less than 2 acres.) (9)

Response: The total acreage of the proposed treatment areas was an approximation. As a result of public and agency input since preparation of the draft EIS, the total area proposed for the control program has been expanded from approximately 91 acres to approximately 100 acres.

Comment: Pages 39 and 40 - Under the heading of "water quality," a very general discussion is given which fails to present any relevant information concerning important water quality parameters. (9)

Response: The purpose of the paragraphs on pages 39 and 40 of the draft EIS was to provide a brief discussion of water quality, upland setting, and aquatic vegetation. This enables the reader to obtain a general understanding of the current environmental conditions and water use of the areas where the control of milfoil is proposed. Specific water quality parameters relevant to milfoil growth are discussed in paragraphs 1.03.5.2, 1.03.5.3, and 1.03.5.5 to 1.03.5.7. Impacts of the proposed project are addressed in paragraphs 4.03.1 to 4.03.10.

Comment: What other control measures are available that might adequately deal with the problems short of the proposed control program (such as screening of water intakes, etc.)? (9)

Response: We have carefully considered all known control measures. A table summarizing these measures and related advantages/disadvantages has been added to chapter 1 of the EIS. Water intake structures are presently screened to prevent debris from passing through the intake pumps and to lower the intake velocity to reduce fish loss. These screened intakes still become clogged with aquatic vegetation and require periodic maintenance.

Comment: Page 43 - The acknowledgement in the draft EIS that the Okanogan Valley "is a critical deer-wintering ground and is an important area for waterfowl" and other species would seem to indicate that great care should be taken to protect those resources from the risk of adverse effects resulting from chemical control methods (i.e., the introduction of toxic substances into the water system. (9)

Response: Search of available literature indicates that 2,4-D, the only acceptable chemical proposed under the plan for the Okanogan area, is not toxic to mammals or waterfowl at concentrations necessary for milfoil control.

Comment: Page 46 - Local government agencies indicated this spring in the Seattle area that "substantial development permits" would be required for the use of chemical control methods under the Shoreline Management Act. This is most appropriate in that one of the purposes of that act was to protect environmental quality. (9)

Response: The possible need for a substantial development permit for chemical treatment has been indicated in paragraph 3.03.1 of the final EIS.

Comment: Page 47 - The use of the words "opponents of chemical treatment" to characterize those persons/groups who appealed the inappropriate issuance of the permit by the DOE to allow chemical treatment would seem to indicate a value position by the authors of this draft EIS. Whether or not a person was opposed to the use of chemicals, the inappropriate nature of the DOE decision left considerable room for opposition on other grounds. (9)

Response: No value position was intended. The primary objective of the challenge to the state permit was to prevent the chemical treatment of milfoil populations in Lake Washington. We are unaware of what the "opposition on other grounds" refers to. Paragraph 3.05.2 has been updated to include the results of the state legal proceedings.

Comment: Page 48 - Although "minor" adverse impact of "short duration" are identified for mechanical harvesting, similar impact which would be caused by chemical treatment are down played. (9)

Response: Paragraphs 4.01.1 and 4.01.5 deal with impacts to air quality, noise, and traffic. Chemical treatment would have less impact to these features than mechanical control because the period of operating the equipment would be much shorter.

Comment: Page 53 - It is indicated that the selectivity of 2,4-D will result only in kill of Eurasian watermilfoil and stargrass. This may or may not be; however, if it is so, how will this be "beneficial" with regard to other nontarget species? If nontarget species take over where Eurasian watermilfoil and stargrass were growing, the net result is merely a change of species of aquatic plant present with the species other than Eurasian watermilfoil still able to cause similar impacts with regard to recreational boaters. Is it the Corps' position, as implied here, that 2,4-D will not kill *M. exalbescens*? (9)

Response: Milfoil has the tendency to crowd out and/or shade out most native plant species. Removal of the milfoil allows these species to expand in the treated areas.

Milfoil grows to a density and height greater than most native species, thereby causing adverse impacts to recreational boaters to a much greater degree than do native species.

2,4-D will kill *Myriophyllum excalbescens* as well as *M. spicatum*. Paragraph 4.04.5.1 has been revised in the final EIS.

Comment: Page 59 - Eagles have been sighted feeding on fish in Lake Washington and, therefore, are an endangered species that might be affected by a chemical control program. (9)

Response: The chemical control program is not expected to jeopardize the continued existence of the threatened bald eagle should it inhabit the Lake Washington area. This determination is based on our evaluation that the concentration necessary to control milfoil is below the toxicity level of the eagle's main food source (fish) and of terrestrial species (e.g., the eagle) and the fact that 2,4-D is not accumulated in the food chain. Further, the total area to be treated in Lake Washington is approximately 100 acres compared to a total surface area of 22,000 acres, and if chemical control is used, treatment will consist of only one application per year during the period May through July.

Comment: Page 65 - It should be noted that 2,4-D, 2,4,5-T, and 2,4,5-TP are all phenoxy herbicides and appear to be both chemically and biologically similar. The present ban on 2,4,5-T and 2,4,5-TP, due to their being "imminent hazards" to human health and the environment, has finally come about due to massive scientific evidence and public pressure in the face of industry resistance and reluctant government agencies. The chemical and biological similarities of all three of these phenoxy herbicides would be more than adequate cause for not using 2,4-D for prudent and concerned persons. (9)

Response: Chemicals of similar structure, although having some of the same properties, can have major differences in chemical and biological reactions. Each chemical must be evaluated separately. To date, scientific evidence for 2,4-D has not placed it in the same restriction category as 2,4,5-T and 2,4,5-TP.

Comment: Page 67 - The near total lack of biological control is most interesting in view of British Columbia snail report and the statement on page 67 that such methods "may be the most economical and the least (environmentally) disruptive" in the future. (9)

Response: As stated in a previous response, further study of the preliminary observation report is needed to determine the applicability of the British Columbia snail as a biological control of milfoil. Other possible biological controls are being researched, but none has been approved for use at this time. State law prohibits the use of the white amur fish.

Comment: Page 6? - The question of illegal actions on the part of shoreline property owners is more a commentary on the lack of enforcement of environmental laws than anything else. Furthermore, it reflects miseducation of those property owners by the Corps and recreational boaters in an attempt to pursue agency policy. (9)

There is raised in the draft EIS the threat that herbicides might be used clandestinely if not approved. The possibility always exists that someone will do something illegal or dangerous because he has not had immediate satisfaction. We cannot accept that as justification for taking such an action. We suggest that the Corps point out, jointly with this threat, the risk that such action involves, as well as the reminder that there ARE alternatives to herbicides. (29)

We were surprised that both the Corps in its draft EIS, and its local sponsor, the DOE, should mention possible illegal use of chemicals by private property owners as a rationale for instigating a chemical control program. Personal abuse of the law is the worst possible treatment. Vigilante dumping of chemicals is not a question of civil disobedience. It is simply breaking the law. In the future, both the Corps and the DOE should take the strongest possible stance against this practice. (32)

Response: The information in the draft EIS was included not to condone or to encourage illegal actions related to unregulated use of either chemical or mechanical treatment methods, but to fully present all real aspects of the no action alternative.

Comment: Page 70 - It is noted on page 70 that chemical control will result in long lasting impacts on water quality due to the chemicals used, and may result in accumulation of residues in the sediments. These impacts were ignored by the draft EIS in foregoing sections. (9)

Response: The draft EIS states there will be longer lasting impacts on water quality. This statement is a comparison of chemical control impacts on water quality to those caused by mechanical harvesting. Impacts to water quality caused by chemical treatment are also discussed in paragraph 4.03.5 of the final EIS.

Comment: The EPA cannot and likely has not stated that "2,4-D is not immininently hazardous to the environment" because the EPA hasn't done its evaluation yet and doesn't know. The EPA has taken the passive tack of simply not stating that it is an "imminent hazard." (9)

Response: The Deputy Assistant Administrator for Pesticide Programs, EPA, Washington, D. C., in a letter dated 2 May 1978, to the Honorable James A. Nielsen, Minister of the Environment, Province of British Columbia, stated, "At this point, EPA has no intent to issue a ban on the further use of 2,4-D. An immediate ban would only be issued in the event that there was evidence that continued use of the chemical during the necessary review period would be imminently hazardous to the environment. This does not appear to be the case here."

Comment: Page 72 - The "public participation" program to date appears to be more designed to generate support for Corps policy than to allow for meaningful participation by all affected and interested citizens. Although I requested a response to the input which I attempted to provide via the "public information pamphlet" question section, none was ever received. (9)

Response: The emphasis of our public participation program has been to inform the public of the problem, explain our proposal, and solicit public input. All comments received in response to the public information pamphlet and the questionnaire were addressed in our public brochure which was mailed in August 1979 and distributed at the public meetings in September 1979.

Comment: All control methods would, to some degree, require irretrievable commitment of petroleum resources. This would be another adverse effect. No comparable figures are given in the draft EIS; however, the use of chemicals requires consumption of such resources in both manufacture and application, wheras mechanical control utilizes them only in treatment (in terms of continuing commitment). (9)

Response: The use of fuel during treatment is discussed in chapter 8 of the final EIS. Paragraph 8.01.2 has been revised in the final EIS to include the use of petroleum during the manufacturing of the herbicides.

Comment: Pages B-4 and B-5 - Were no answers received to these letters? (9)

Response: No reply was received to our 30 January 1979 letter to the Office of Archeology and Historic Preservation shown on page B-4. That office did comment on the draft EIS. A copy of their letter is

contained in appendix C. No response was received to our 15 June 1978 letter to the Soil Conservation Service (page B-5).

Comment: Pages B-15 through B-36 - There are a number of pertinent comments in the letters of coordination from the Washington Department of Fisheries, U.S. Fish and Wildlife Service, and National Marine Fisheries Service that the Corps seems to have disregarded in the draft EIS. Included in those letters, but not in the text of the draft EIS, are identification of important wetlands areas in Lake Washington (which are nearly identical to the proposed treatment areas as per page B-27), a call for bioassays of various life stages for important native species like salmon, notice that the toxicity data for fish such as the information in table 2 of appendix A of the draft EIS is unacceptable and inadequate (by all three agencies), and the need for timing restrictions to protect salmon. (9)

Response: The locations of wetlands and salmon migration routes and spawning areas have been added to figures 5 through 12A of the final EIS. Any chemical treatment operations will be coordinated with fishery agencies and timed to protect peak migration and spawning periods. All readily available toxicity data for fish have been included in table 2 of appendix A. No specific bioassays are planned for the management program; however, as new toxicity data are developed in future years by other private and public organizations, this information would be used in our annual program supplements.

Comment: Page 1, Paragraph 2, "The primary control methods would be chemical harvesting and 2,4-D application." - Endothall is mentioned under "other treatments." This is very surprising, since, in the past in other areas of the United States as well as in the northwest, endothall was considered the preferred material for the control of milfoil based on its activity, amount of toxicology information, fate in the environment, etc., as well as economics.

Page 13, Section 1.04.5.2 - It is incorrect that endothall "does not affect plant roots." Endothall is not translocated to plant roots but, indirectly, roots are affected, and there is no evidence that regrowth of a plant treated with endothall will occur sooner than those treated with 2,4-D.

". . . would kill many native species. . . ." - No chemical is selective to milfoil only. Among 12 plant species mentioned on page 40 under section 2.02.7.1 occurring in Lake Washington, endothall will control only four species.

". . . would kill many terrestrial species. . . ." - At concentrations of approximately 2 ppm of endothall at the time of treatment (which would decrease to a fraction of a ppm within a day or two), endothall will not affect terrestrial plants.

Page 16, Section 1.05.1 Through Section 1.06.3 (Pages 24 Through 30) - Endothall is mentioned as possible treatment in only three areas. The same pertains to proposed treatments in other areas.

Page 47, Section 3.05.2 - After the 5-day hearing, the State Pollution control Hearing Board affirmed previous DOE decision to allow the use of Aquathol "K" Aquatic Herbicide in Lake Washington.

Page 53, Section 4.04.5.2 - It is true that weeds mentioned herewith may be killed by the use of endothall. However, only a few of these occur in Lake Washington. Besides that, there are others which will not be affected (Elodea, Chara, Juncas, Nuphar, Nymphaea, Typha, and Nitella).

Present Aquathol K label restrictions do state that treated water cannot be used for irrigation within 7 days of treatment. However, this restriction was based on insufficient amount of data in support of registration of Aquathol K a number of years ago. Based on data collected since that time, a label now pending in Washington, D.C., waiting for their registration, does not have any restrictions regarding use of treated water on crops, for domestic purposes, for drinking, etc. The reason we are mentioning this is that, hopefully by the time of additional treatments, a new label will be issued.

Page 55, Section 4.05.2 - See previously made comments.

Page 60, Section 4.15 - In accordance with our comments under section 4.04.5.2, proposed label will not bear any restrictions regarding fishing and swimming.

Page 62, Section 5.05 - Based on many years of experience with endothall as well as other chemicals, if properly used, kill of fish will not result; especially since total body of water is not treated.

Page 70, Section 7.01.2 - Chemical control of aquatic weeds. Endothall does not have any long lasting impact on water quality due to persistence of chemical, since it lasts only for a couple of days in insignificant amounts. Also, it will not impact the long-term productivity of the water body, since chemical residues do not accumulate in the sediment.

Page A-7 - LC_{50}s referred to endothall acid which is not correct. Toxicity information pertains to potassium or sodium salts of endothall.

Page B-5 - Pimental, D., 1971. This report is a poorly done EPA summary, is not complete, and it can be misleading.

In general, we believe that the Corps of engineers does not give enough consideration to use of endothall. It is equally as effective as 2,4-D for the control of milfoil and, at the same time, considerably more favorable information is available pertaining to toxicity, especially long term, as well as impact on the environment. This was very evident during above-mentioned hearings by the State Pollution Control Board Hearing. The same pertains to toxicity to fish and wildlife. (11)

Response: The information in the draft EIS concerning the various chemical alternatives was obtained from the commercial labels and readily available scientific literature. Our recommendations were based on this information.

Our program does include provision for evaluation of the effectiveness of the treatment methods being used. Also, our Waterways Experiment Station will be doing experimental treatment on different control methods, including endothall, as part of their research program. The results of our program evaluation and the experimental research will be reflected in the treatment methods proposed for use in future years.

Paragraph 4.04.5.2 concerning the effects of endothall on upland vegetation has been revised in the final EIS.

Comment: Are the conclusions of this study and of the DEIS's analysis of no action impacts widely accepted? Specifically, how contested is the conclusion that without a control program milfoil would spread to a maximum within probably 5 years (see p. 68)? (13)

Response: We have received no specific comments concerning the 5-year projection for Lakes Washington, Sammamish, and Union. We believe that the Seattle area is less than the optimum environment for milfoil. We do expect that there will be years of heavy growth, as well as years of lighter growth, due to variations in climate conditions. A few successive years of good conditions could cause a large expansion of the range and the density of milfoil in this area.

Comment: The draft EIS outlines the proposed treatment areas for 1980. Since none of the possible control methods would completely eradicate milfoil and some of the proposed methods (e.g., mechanical harvesting) do not even kill milfoil, is it anticipated that the areas treated in 1980 would need to be treated indefinitely over subsequent years? Does the aquatic plant management program have a specific time frame? If mechanical harvesting or chemical control occurs for 1 year only, for how long would the different treatments be effective; how much would the milfoil population of the year following treatment be reduced from pretreatment level? The EIS should discuss these questions as part of the general project description. (13)

Response: The proposed treatments on Lakes Washington, Sammamish, and Union will be maintenance level operations, with repeated treatments necessary because of regrowth from the root stock and from fragmentation. The program operations could increase or decrease, depending on the extent of milfoil growth in any one treatment year. The general assumption is that chemical treatment would have to be done once a year and mechanical harvesting would have to be done twice a year. Repeated treatments could put enough stress on the plant population to eventually require fewer treatments. The program described in this final EIS is for Fiscal Year (FY) 1980 (1 October 1979 through 30 September 1980) only. Beyond FY 1980, if milfoil

growth declines, the program would taper off. If the problem increases, the program could be expanded through the coordinated efforts of local and state governments and the Corps of Engineers. Accordingly, local governments, with the Department of Ecology, will develop an annual statewide work plan for submittal to the Corps of Engineers. The Corps will prepare an annual letter report to be used for submitting budgetary requests, and for requesting approval from the Office of the Chief of Engineers for changes in the program. The contract between the Corps of Engineers and Department of Ecology would be awarded for a maximum period of 12 months. If the option-to-extend clause in the contract is exercised by the Corps, the contract may be extended annually for a total duration not exceeding 3 years, after which a new contract will be necessary to continue the program.

Comment: If the public awareness program is implemented, the public should be informed of the hazards of unregulated herbicide use as well as of the problems of milfoil itself. As Charles Chambers points out (p. B-19), " . . . perhaps the greatest threat to fish and wildlife from milfoil is the uncontrolled citizen use of herbicides . . . ." (13)

Response: We agree that uncontrolled chemical treatment could cause serious problems. Nothing is presently included in our public information program on this subject, but could be added if the Washington State Department of Agriculture, who has the responsibility for regulating herbicide use, detects the need.

Comment: The impacts of chemical control (particularly of 2,4-D control) need to be further explored. To date, is there any data on the effects of 2,4-D on the juvenile stages of fish and other wildlife? (Juveniles may be much more susceptible than adults.) What age distribution of test animals was used to generate the data in tables 1 and 2 (appendix A)? (13)

Response: There is very little information available concerning the impacts of 2,4-D to juvenile stages of fish. The age distributions of the test animals included in tables 1 and 2 of appendix A (now tables 2 and 3 in appendix C) are unknown.

Comment: A description should be made of local water supplies and the distance of any intake structures to the proposed management areas. Possible effects upon intake quality and any ground-water recharge areas in the project lakes should be carefully addressed. (14)

Response: Because of the statewide nature of our proposed program, it is not possible to indicate all water supply intake structures. Intakes will be identified by the contractor prior to any chemical treatment, and monitoring will be accomplished and treatment restrictions implemented to insure the safety of water users. Because of the nature of the proposed chemicals, we anticipate no problems associated with ground-water recharge.

Comment: It has been our experience that aquatic vegetation can both improve and degrade water quality. Water quality can be improved from the uptake of nutrients by aquatic vegetation. According to the EIS, the project lakes are affected by: sewage overflows, municipal sanitary wastes, other point discharges, land managment practices, and septic tank leachate from extensive shore property development. It appears that the high nutrient concentrations from these pollution sources are partly responsible for supporting the "lush populations of aquatic vegetation," including milfoil. The water quality benefits--such as providing a nutrient sink--of these aquatic plant populations should be noted. In addition, the benefits of milfoil and other aquatic plants in preventing shore erosion by providing a wave buffer should be addressed. (14)

Response: The value of aquatic vegetation, including the removal of nutrients from the water, is discussed in paragraph 1.03.2 of the final EIS. The prevention of shore erosion has been added to that paragraph.

Comment: The decomposition of large populations of milfoil or any aquatic vegetation may also degrade water quality. The EIS indicates that milfoil adversely affects dissolved oxygen concentrations, reduces benthic invertebrates and possibly causes fish kills. Have any fish kills ever been reported that were caused by milfoil, its nighttime respiration, or its natural decomposition? According to the EIS, the Fish and Wildlife Service has not been able to document any adverse effects of milfoil on either fish or wildlife. Instead, there is more concern with the threat that the control chemicals may have upon fish and wildlife. Casoron treatments--though probably uncontrolled--have already resulted in one reported fish kill in Lake Washington. (14)

Response: No reports of fish kills in Washington State have been attributed to the growth of milfoil at this time, but the possibility exists in warm, shallow water areas from depletion of dissolved oxygen due to decomposition of milfoil. We are concerned with the effects of uncontrolled milfoil treatment methods. The fish kill in Lake Washington in 1978, which was initially attributed to an illegal application of Casoron, was found to have been unrelated, resulting instead from a fungal infection.

Comment: The effects that powerboats have had in fragmenting and spreading milfoil should also be discussed. (14)

Response: A discussion of this aspect is included in paragraph 1.03.1 of the final EIS.

Comment: We believe the EIS should discuss the extent to which milfoil infestation has increased mosquito populations in the project areas. Furthermore, the significance of the problems associated with mosquito breeding in the lush stands of aquatic vegetation should be addressed. Considering the percentage of the infested lake areas to

be treated, any benefit from the reduction of potential mosquito breeding areas should be placed into proper perspective. (14)

Response: Public input has indicated an increase in mosquito populations since the establishment of large milfoil populations in the Seattle area. This increase has not been quantified and, so far, no outbreaks of mosquito-borne diseases have been reported. The program-related reduction of mosquito breeding area would be proportional to the percentage of the infested area treated and the effectiveness of the treatment method. Paragraph 4.08.1 has been expanded to discuss this potential beneficial impact of the management program.

Comment: We have reviewed your draft environmental impact statement and find there are no historic/archaeological properties on the State or National Register of Historic Places, or the Washington State Inventory of Historic Places, that will be impacted by the project.

In the event that activities are proposed which may affect known or unknown archaeological resources, please notify the Office of Archaeology and Historic Preservation in Olympia. (16)

Response: Your review is appreciated. Your office will be notified should it be found that the activities proposed affect known or unknown archaeological resources.

Comment: Any comparison of costs between alternative control methods should be done on an annual basis. For example, if chemical treatment is necessary each year and bottom shading is effective for several years, or a portion of its costs counts toward more than 1 year, then this must be taken into account in the cost comparisons. Further, because 2,4-D is reported to also kill roots, a study should be initiated to determine if such treatment extends the control period and eliminates the necessity of annual or semiannual harvesting. A determination of this type could alter the cost/benefit analysis if calculated on an annual basis. (18)

Response: The effectiveness of the various treatment methods would be studied as part of our program evaluation. Root bill and selectivity of the chemicals and the need for retreatment for all alternatives would be evaluated. The program covers only one year so the capital cost of bottom screens must be included in the first year cost per acre (bottom screening is no longer available on a rental basis in the Seattle area). It is noted in paragraph 1.04.6 of the final EIS that the costs for bottom screening beyond the first year would be based on maintenance only for the remaining life of the screen.

Comment: We suggest that the Corps of Engineers consider adding a patrol in the Lake Washington system to pick up the large masses of free floating milfoil which clutter the docks and moorages. We believe that such a patrol, with an adequate pickup vessel, should help reduce the rate of infestation. (18)

Response: Because of the large number of fragments in the Lake Washington system, removal of the larger floating mats would not significantly affect the rate of infestation.

Comment: Section 3.04 mentions that the proposal is in compliance with local land-use policies. The Final EIS should substantiate this statement with regard to agreements with local agencies concerning their land-use policies. It would seem difficult to determine any compliance with some land-use policies when the areas and methods for treatment have not yet been finalized. (18)

Response: Because of the necessity of local government approval and, for many cases, local cost sharing, compliance with local land-use policies would be required prior to program implementation. Permits may be necessary and would be obtained as required. The last sentence in paragraph 3.04 has been deleted in the final EIS.

Comment: Page B-10 of the appendixes mentions the use of copper sulfate, but the draft EIS does not include it in the chemical control methods. The final EIS should explain why copper sulfate was not included in the methods for chemical control. (18)

Response: The copper sulfate herbicides are not labeled for use in milfoil control. They were included by the State Department of Agriculture on the total list of herbicides approved for use in Washington waters.

Comment: The DEIS refers to two existing milfoil treatment programs in Washington; Lake Washington (Ref. Para. 3.05.2); Osoyoos Lake (Ref. Para. 2.03.7.2). The success and impact of these programs should be described more fully in the final EIS. (20)

Response: The treatment program discussed in paragraph 3.05.2 has been updated in the final EIS. The discussion of the treatment mentioned briefly in paragraph 2.03.7.2 has been updated in paragraph 3.05.2 of the final EIS. The evaluation of these treatments has not been completed at this time.

Comment: We suggest the final EIS contain more detail about program administration, to allow the reader a greater understanding of how areas will be selected for treatment. The information on page 15 could be expanded to indicate who determines whether an area meets the listed criteria, how areas are prioritized for treatment, and whether the state can assume funding for high priority areas not funded locally. We believe a truly comprehensive statewide program requires the state to take a strong management role rather than simply responding to local requests. This is especially important for the prevention program. (20)

Response: Paragraph 1.12 of the final EIS explains the priorities of the management program. Paragraph 1.13 of the final EIS includes more detail about program administration.

Comment: We suggest the third criterion on page 15, dealing with environmental impact, be made more specific. Environmentally sensitive locations, as identified for example by the State Departments of Fish or Game, should probably not be treated. We also suggest adding a criterion that treatment in the proposed area is expected to be effective. (20)

Response: Because of the wide range of possible environmental conditions, the criterion concerning impacts must be general in nature. Specific concerns of the State Departments of Fish and Game have been addressed. All treatment methods proposed are known to be effective against milfoil. Our program evaluation will establish comparative effectiveness of the alternative control methods.

Comment: The statement on page 6 (1.03.4) concerning adverse impacts of watermilfoil on waterfowl is not consistent with information on page B-19 from the U.S. Fish and Wildlife Service referring to British Columbia studies. (20)

Response: The impact of milfoil upon waterfowl is subject to debate. As stated in paragraph 1.03.4 of the final EIS, milfoil growth does result in a decrease of traditional waterfowl food sources. Stevenson and Confer (1978) reported that some species were able to adapt to a decrease in food sources, while others left the area.

Comment: On page 31, there is a general description of the "Prevention Program," but there is no indication as to the extent of state or local involvement expected by the Corps in "Aerial Surveillance and Regulatory Inspections." What is meant by "Regulatory Inspections" and who (state, local, or USCE) is expected to perform them? A description of the procedures involved in developing a cost-sharing aquatic plant management program with the Corps, along with a PERT diagram of all significant activities and the responsible agency, would be especially helpful. (21)

Response: Every year, the Corps of Engineers takes aerial photographs of the state's navigable waters as part of the permit regulatory program. These aerial flights are completely separate from the aerial surveillance proposed for the Aquatic Plant Management Program, but could be done at the same time to minimize expenses. The Corps could do the flights, but the cost would be subject to matching funds from the state. A cooperative agreement between the Corps and the State Department of Ecology would establish the cost-share program. Further, the Department of Ecology has the option of either doing the work themselves or having local government do it through established agreements.

Comment: The first two species of aquatic plants mentioned under paragraph 2.02.7.1 on page 40 should be capitalized since they recognize the name of the person who originally keyed the plant (i.e., Potomogeton Berchtoldii and P. Richardsonii). (21)

Response: According to the International Code of Botanical Nomenclature (Article 73F), published in 1961, in the interest of standardization, species named after people should not be capitalized.

Comment: On page 68, under "No Action," statements such as "Obstruction to navigation and recreational use would progressively increase . . . ." Use of terms such as "would possibly" may be more appropriate since the impact of no action is not all that certain. There have been cases where milfoil infestations have actually decreased when left alone. (21)

Response: Agreed; paragraph 6.02.1.3 has been revised in the final EIS.

Comment: On page 14, under paragraph 1.04.10, it states that "Each barrier is only 80 to 90 percent effective in stopping milfoil fragments . . . ." The effectiveness of a mechanical barrier has never really been determined; therefore, it would be more technically accurate to simply say that "A barrier is not 100 percent effective in capturing all milfoil fragments." (21)

Response: Fragment barriers have been used for several years in British Columbia. The estimate of effectiveness comes from their Ministry of the Environment and is the best information available at this time. Evaluation of the barrier structure was done by our Waterways Experiment Station but their report is not yet complete.

Comment: What is meant by the application of minimun levels for chemical control? We would also appreciate learning the concentration of 2,4-D BEE throughout the water column over time. (23)

Response: The minimum levels for chemical control are the lowest concentrations of the herbicide required to effect control. Table 1 of appendix C of the final EIS gives some information on 2,4-D concentrations and their persistence in the water.

Comment: The Corps of Engineers is to be commended on the excellent figures in the text denoting milfoil infestation and proposed treatment areas. We note, however, there are no figures for Seward, Madrona, and Pritchard Parks. For your convenience we are enclosing charts depicting known sockeye salmon beach spawning areas where no control measures should be undertaken between 1 November and 15 June of the following year to protect incubating eggs and fry. (23)

Response: Since specific treatment areas have not been proposed for Seward, Madrona, or Pritchard Island Parks, figures were not included. The location of these parks is shown on figure 4. The sockeye salmon spawning areas have been added to our figures. We appreciate your input.

Comment: The Department of Fisheries has no concern for proposed treatment in Osoyoos Lake on the Okanogan River during the months of July and August and have issued Hydraulic Project Approvals jointly

with the Department of Game for milfoil barriers at the outlet of the lake. (23)

Response: Noted.

Comment: We suggest expanding the Fish and Wildlife paragraph (202.3) to specify timing by species as supplied throughout this letter. (23)

Response: Restrictions due to salmon presence have been noted. Timing restrictions will be site specific and will be coordinated with the appropriate agencies. This is noted in paragraph 1.06 and 1.08.2 of the final EIS.

Comment: Hydraulic Project Approvals from the Departments of Fisheries and Game will be required for installation of barriers and screens. (23)

Response: Noted.

Comment: We appreciate having our letters on this topic dated 29 July 1977, 1 May 1978, and 6 July 1978 included in appendix B. Our letter to the Department of Ecology dated 24 April 1979 should also be included. (23)

Response: Your letter of 24 April 1979 has been included in appendix D of the final EIS.

Comment: We suggest including the following publications which have been used for our review and recommendations:

Folmar, L. C. 1977. Acrolein, dalapon, dichlobenil, diquat, and endothal: bibliography of toxicity to aquatic organisms. Technical Papers of the U.S. Fish and Wildlife Service. No. 88. 15pp.

Lorz, H. W., S. Glen, R. H. Williams, C. M. Kunkel, L. A. Norris, and B. R. Loper, 1979. Effects of selected herbicides on smolting of coho salmon. Environmental Protection Agency, Corvallis Environmental Res. Lab. (In Press).

Meehan, W. R., L. R. Norris, and H. S. Sears. 1974. Toxicity of various formulations of 2,4-D to salmonids in southeast Alaska, J. Fish. Res. Board Can. 31:480-485.

Schults, D. P. and P. D. Harman. 1974. A review of the literature on the use of 2,4-D in fisheries. Bureau of Sport Fish eries and Wildlife, Report No. PB-235-457. Available through N.R.I.S. (23)

Response: These publications were reviewed during our study. Those that were referenced in the final EIS have been included in the bibliography.

Comment: Areas close to the mouth of the Sammamish River should receive particular attention as to choice of treatment and timing. Downstream migration of salmon should be complete by about mid-July, but adults begin concentrating in the area about the first of August. High summer temperatures in the Sammamish River cause a migration block to salmon, annually until fall rains begin. (23)

Response: The mouth of the Sammamish River is not proposed for treatment, but the salmon-use areas have been indicated on figure 6 of the final EIS.

Comment: Portage Bay in the ship canal is the only area proposed for treatment in Lake Union. Use of herbicides could be very hazardous because the proposed area is probably directly in the fish migration route rather than adjacent to the migration route like in Union Bay. Use of mechanical harvesting or screens may be the only safe technique at this site. The Corps of Engineers should also contact the University of Washington's fish hatchery for location of the water intake structure(s). (23)

Response: The salmon migration route has been indicated on figure 12. Any proposed treatment of this area will be coordinated with the University's Department of Fisheries.

Comment: We suggest reconsidering of sand and gravel blankets in certain areas because no impact to salmon should occur unless located on a spawning beach. (23)

Response: If areas are identified in which sand and gravel blankets are better alternatives than the methods we have proposed, they could be added to the management program in future years.

Comment: Have marinas, bulkheads, and breakwaters encouraged the growth of milfoil by restricting flushing? Could hydraulic improvements to allow greater flushing help control growth in these heavily used areas? (24)

Response: Milfoil is a very competitive species which can do well in a wide range of environmental conditions. Increased flushing would probably not control its growth and in itself could have significant environmental impacts.

Comment: Is there any possibility that milfoil control could actually encourage infestation by maintaining conditions that allow for explosive growth and eliminating natural limiting factors? If all vegetation is removed from an area, would this allow recolonization of the milfoil? (24)

Response: Within Washington, milfoil is an exotic species and does not respond to natural limiting factors in a way that enables it to coexist with native plant species. Instead, left uncontrolled, milfoil tends to grow to its maximum density, outcompeting most native species. Control with 2,4-D, which is selective for milfoil,

should promote the growth of native species. Other controls which are not selective, such as mechanical harvesting, endothall, diquat, and dichlobenil, may result in a competitive advantage for milfoil when the area treated grows back.

Comment: Is there any correlation between milfoil and encephalitis outbreaks? It seems unlikely that milfoil would increase mosquito-borne diseases (page 58). (24)

Response: Public input has indicated that the number of mosquitos in the Seattle area has increased since milfoil has infested the area lakes. No correlation has yet been made between milfoil and encephalitis.

Comment: We are concerned with the impact of large amounts of dissolved oxygen being "taken out of the water by the biological decomposition of dead milfoil." This can be critical, since the preferred time for chemical treatment is summer, a time when dissolved oxygen is reduced as a result of elevated water temperature. (24)

Response: The preferred time for chemical treatment is early in the growing season when the biomass and, therefore, the biological oxygen demand would be low. The strip treatments should provide adequate water exchange to prevent any serious oxygen depletion at any time during the year.

Comment: The Okanogan River and Lake Osoyoos are both important for fish and wildlife production as well as a source of irrigation water (page 44). Does this system hold potential for serious milfoil infestation? It would seem that hydraulic factors involved in the river and reservoir would prevent massive milfoil growth. Streamflow, fluctuating water levels, and low reservoir productivity should limit milfoil. (24)

Response: Our Waterways Experiment Station estimated a potential of 550 acres of milfoil in Osoyoos Lake and 440 acres in the Okanogan River. The main reason that these areas are critical is that they have direct flow into the Columbia River which is estimated to have a potential of about 110,000 acres of milfoil. Streamflow and fluctuating water levels have not been found to prevent milfoil growth in the Okanogan River and lake chain.

Comment: Would you explain what type of barrier would be constructed in Okanogan River to prevent the spread of milfoil (page 30)? Would it interfere with fish migration? (24)

Response: Fragment barriers have been in place in the Okanogan River at Oroville for 2 years. The first barrier was installed and operated by the Department of Ecology and Okanogan County. Another barrier was installed in its place last year under the Corps' research program. It is a screen with buoys attached to piles on the shore. It extends to a depth of 3 to 4 feet, which allows fish passage beneath it.

Comment: We have reviewed the above EIS and find that one environmental element, phytoplankton, has not been addressed. Even though the proposed control program is aimed primarily as a maintenance function, in lieu of total eradication, we would like to see a discussion of the possible effects of chemical control on phytoplankton and related food chains. This should be addressed in paragraphs 2.02.7 and 4.04.5. (25)

Response: The final EIS has been expanded to include a discussion on phytoplankton and related food chains in paragraph 4.06 and in appendix A. The literature reports no significant impact to phytoplankton, zooplanton, and benthic organisms from the application of 2,4-D at concentrations proposed in the treatment program. Further, the concentration at treatment remains in the water column for a relatively short period of time and 2,4-D does not magnify through the food chain.

Comment: What happens to the milfoil remains after the plants have been killed by chemical treatment. Will plant remains wash ashore and cause odor and fouling problems? (25)

Response: Milfoil killed by chemical treatment would sink to the bottom and decompose. The main effects would be the release of nutrients into the water and the buildup of organic material in the sediments. Milfoil controlled through mechanical harvesting will be collected and removed from the treatment site and disposed of in a manner acceptable to the state and local governments. Milfoil which washes ashore does cause esthetic problems, but is made up of plant material which has been fragmented by boats, wave action, or natural abscission.

Comment: One possible cause of the extraordinary growth of the milfoil in the mentioned lakes and waterways is the continuous supply of rich nutrients that originates nearby, upstream, or up the water table.

In the case of lakes whose shores are populated, the following simple process occurs:

I. Fertilizer is spread upon a lawn or other plant life. It is watered in with copious amounts of water.

II. The water enters the water table and migrates downslope into the lake. This water can upwell as much as 50 feet or more from shore.

III. The highly nutrient water flows past the plants and they, in turn, grow profusely.

The same process occurs in rivers and lakes which are supplied by seepage from commercial agricultural fertilization. No amount of herbicide application, mowing, or putting down of netting will control aquatic plants as long as these endless supplies of nutrients are available. If care is exercised in the application of both

domestic and commercial fertilizers, we will solve the problem of excess aquatic growth without resorting to drastic measures. (28)

Response: Nutrient inflow to the lake from domestic and commerical fertilizers no doubt contributes to the growth of milfoil as well as other aquatic plants and algae. Milfoil, however, seems to be able to accomplish very dense growth at low nutrient concentrations to the extent that nutrient inflow from natural sources within the lake, as well as from the watershed as a whole, may be enough to support dense milfoil populations.

Comment: The possibility that humans could ingest some of the herbicides into their systems via absorption through the skin, through the mucous membranes, or directly into the several orifices of their bodies, was not mentioned and obviously has not been explored. (28)

Response: Paragraph 4.08 has been revised in the final EIS to include possible human uptake of herbicides from treated water.

Comment: The final EIS must develop the question of natural cycles of aquatic plants. In some parts of the U.S., Canada and locally, Eurasian watermilfoil appears to be in a natural decline (Metro literature; DEIS page 6, paragraph 1). We request that this matter be researched and included in the final EIS (29)

The Corp's EIS projects the "potential" spread of milfoil in Washington State (page 11) and suggests in the public brochure that this spread would impact not only recreation but irrigation and electric generation. The WEC would like to caution the Corps to emphasize in the final EIS that both the spread of the plant and its adverse impacts are only possibilities. They have not yet and may never occur. No mention is made in the EIS of the natural growth and decline cycles of milfoil. While Chesapeake Bay is mentioned (page 2) as an area of serious milfoil manifestation in the 1960's, no mention is made of the fact that the bay is presently experiencing a natural dieback of the plant. This natural reduction in growth is also occuring in the Wisconsin Lake region and does not appear to be attributable to the mechanical controls used in that area. The causes of these declines are little known, but the pattern of explosive growth followed by declining abundance seems typical. Consideration and study of these natural growth cycles should be made before commitment to a potentially environmentally damaging control program is undertaken. (32)

Response: The history of milfoil growth in the Seattle area in the past 4 years has been 1 heavy year followed by 2 light years and another heavy year, suggesting that this area provides a marginal habitat. The milfoil density will vary from year to year depending on climatic conditions. Eventually, milfoil may be absorbed into the aquatic ecosystem; however, we have no reason to believe that milfoil is in a general decline at this time. Although some areas of the country showed a major decline in the population after several years of severe problems, other areas have had major problems for 20 years

or more, with no indication of decline. The time period required for this plant to reach a natural balance in this area is unknown. The habitat in eastern Washington appears to be much more conducive to milfoil growth than western Washington.

Comment: Would you please clarify the goals and purposes of this proposed program. At the public hearing, it was referred to as a "test program." Please define that term. Also, please explain the 3-year time frame, and how during that time, and beyond it, the COE sees its role pertaining to program/policy decisions, administration and funding. (29)

Response: The 3-year test program mentioned at the public meeting is a research project being conducted by our Waterways Experiment Station at Vicksburg, Mississippi. Their purpose is to test prevention as an operational method of plant control. They will be testing different prevention methods, evaluating them for applicability to our program, and providing us with test information. This test program is funded 100 percent by the Corps of Engineers and is completely separate from the proposed cost-share program. The proposed cost-share program, which would make 70 percent Federal matching funds available to the state for local sponsors for milfoil control, would not have a time limit, but would be evaluated annually and change according to the need. We would be working closely with the local sponsors and the state "umbrella" sponsor (WDE) to establish program direction.

Comment: When the Tennessee Valley Authority increased herbicide applications for milfoil control, the milfoil increased (TVA publication, "Perspective," summer, 1976). What is the explanation for this? It appears to refute the common misconception that herbicides eradicate (kill) milfoil in a single application. (29)

Response: We are not attempting to eradicate milfoil from Washington State. We have stated that any control measures on Lakes Washington, Sammamish, and Union will be of a maintenance nature and require periodic retreatment. TVA found 2,4-D very effective in controlling milfoil in quiet water but less effective in moving water. Their control program reduced infested acreage significantly, but the cost to maintain that level of control became prohibitive. They changed from a large chemical control effort to a program of chemical treatment in conjunction with water-level fluctuation.

Comment: Has 2,4-D, in fact, proven effective against milfoil? We found no citation to substantiate either this assertion or that 2,4-D is selective against milfoil. Could it be that 2,4-D kills native aquatic vegetation, thereby creating a void which milfoil explodes to fill? (29)

Response: As stated in appendix A of the draft EIS, the British Columbia Ministry of the Environment has documented a 98 percent reduction of milfoil in open water treated with 20 pound acid equivalent of 2,4-D during its rapid growth period. Other data is

available from the work done by TVA, other Corps Districts, and the southern states which shows that 2,4-D is effective against milfoil and that milfoil is more sensitive to 2,4-D than most native plant species. One of the program evaluation goals of the Aquatic Plant Management Program is to establish effectiveness and selectivity of 2,4-D in Washington waters.

Comment: Also, we would like for you to identify the term "management" as used in "aquatic plant management program." For this draft EIS, does "management" refer only to milfoil? (29)

Response: The proposed Aquatic Plant Management Program includes both control and prevention operations. It is termed a management program because it presents a comprehensive statewide proposal with many different elements. At this time, milfoil is the only target species.

Comment: Is there a contradiction of goals on eradication of milfoil? On page 29 (1.06), the Prevention Program states, "Total eradication of milfoil colonies would be attempted in those areas which directly threaten uninfested navigable waters." However, on page 15, paragraph 4, eradication attempts have not been successful elsewhere and would not be attempted in Washington State. (29)

Response: There is no contradiction of our goals. The key on page 15 of the draft EIS was the wording "Efforts to eradicate firmly established populations of milfoil . . . ." The prevention program would be dealing with small pioneer colonies of milfoil which have not become firmly established.

Comment: The DEIS does little or nothing to delineate the causes of milfoil growth in northwest waters. Without this information, any control (treatment) program is likely to be cosmetic in nature, necessitating perennial retreatments because the factors favoring milfoil growth have not been changed. (30)

Response: The control efforts on Lakes Washington, Sammamish, and Union will require periodic retreatments. The causes of milfoil growth in northwest waters are not definitively known; however, milfoil seems to thrive at nutrient and light levels below those required by most native plant species, and this has a competitive advantage which tends to upset the natural balance of the aquatic ecosystem.

Comment: The DEIS expresses concern that if milfoil is not controlled now, it will "infest" ever greater areas of freshwater in Washington state. As stated above, we question whether milfoil growth is expanding. Moreover, we do not understand how treating very limited areas along private docks and marinas, leaving the vast majority of the milfoil acreage untreated is going to stop the growth you project? If these treatments are not intended to stop that growth, what is the purpose of this "management program"? (30)

Response: The objective of the control program, which proposes work on Lakes Washington, Sammamish, and Union, is to reduce obstructions caused by milfoil in high-use recreation areas. The purpose of the prevention program, which is statewide, is to prevent the spread of milfoil to uninfested waters by fragmentation and direct flow, or by the transport of fragments by recreational boaters.

Comment: One of the items of concern to the Corps is the impact of the program on community cohesion (page 60). We object to the implication that any aquatic plant control program "is sure to cause increased friction" between environmentalists and property owners. Must we infer from this statement that no environmentally sound control program is possible? It is clear even from the preliminary report of the Corps that an environmentally sound/economically feasible program is possible. A mechanical harvest program coupled with screening in shallow beach and dock areas would provide an effective solution not only to the aesthetic/recreational needs of the lakeside property owners but to aesthetic/environmental needs of conservationists and the community at large. This option must be given adequate attention in the final EIS. (32)

Response: Even before the Corps of Engineers became involved in the aquatic plant study, opposing views existed concerning approaches to milfoil control. We have not witnessed the development of any concensus. Generally, one group wants immediate chemical control and maintains that mechanical treatment is a waste of taxpayers' money, and one group maintains that chemical treatment is totally unacceptable. Our program includes both approaches, thus giving the local governments the option to select the one most acceptable to their specific situations.

Comment: The Grant County Chapter of the W.E.C. would like to know where Grant County waters, including Billy Clapp Lake, Banks Lake, and the Evergreen Reservoir, stand in your program, in recognition of their inclusion in the draft EIS as infested areas. (33)

Response: Because Billy Clapp Lake, Banks Lake, and the Evergreen Reservoir are part of authorized Federal projects (Bureau of Reclamation), they cannot be included in this program. Grant County waters that would be included are the Columbia River reservoirs where surveillance and possible spot treatments would be undertaken.

Comment: While mechanical harvesting of the milfoil also has problems, we do believe the Corps should thoroughly analyze the different types of devices and methods available to harvest milfoil. For example, mention should be made of the Maggs milfoil-cutting machine being developed in Richmond, British Columbia, and already successfully tested in Lake Okanogan in July of this year. This plow cleared 600 square yards of dense milfoil, including root nodules, in a one-hour test run. According to Mel Maxnuk of the British Columbia Water Investigation Branch in Vernon, inspection near the end of August showed the area plowed by the machine had remained clear of growth. Reference: Wenatchee World, Aug. 27, 1979. (33)

Response: We have worked closely with the Canadian Government and have drawn upon their experience for much of our information about treatment methods. Our program considered alternatives that are commercially available. According to the British Columbia Ministry of the Environment, the Magg's harvester is still considered experimental and has not yet received adequate testing. In future years, should this or any other effective treatment method become available, such could be incorporated into the program and discussed in the annual program supplements.

Comment: The Columbia River environment is not even discussed in the draft EIS yet five reaches of the Columbia are part of the Eurasian watermilfoil prevention program and according to the Aquatic Plant Management Program Public Brochure, August 1979 (but not the draft EIS) eradication of Eurasian watermilfoil colonies in the Columbia River Reservoirs will be attempted using applications of 2,4-D, the suction dredge, rotovation, or hand pulling. 40 CFR 1502.15 states that the EIS shall succinctly describe the environment of the areas to be affected by the alternatives under consideration. The Corps of Engineers has not done this with respect to the Columbia River and, in fact, only one sentence appears in the draft EIS which indicates that five reaches of the Columbia are indeed part of the prevention program (Page 30, Sec. 1.06.4). Considering the importance of the Columbia River to the Pacific Northwest the environment of the Columbia should be examined and the impact of the proposed prevention program as it affects the Columbia should be discussed. (35)

Response: To date, milfoil has not been identified in any section of the Columbia River. The only operations presently scheduled for the Columbia under the Aquatic Plant Management Program are aerial and ground surveillance. Spot treatments, which would not constitute a major Federal action, may become necessary if, in the future, milfoil is discovered in the Columbia River. It is, however, not possible at this time to know when or where milfoil may appear and, therefore, site-specific information is unavailable.

Comment: The relationship between the local sponsors, the Department of Ecology (DOE) and the Corps of Engineers is not clear to us, particularly since we have learned that there are as of yet no local sponsors for the 1980 program. The Corps of Engineers has stated on several occasions that local sponsors would submit treatment proposals to DOE for inclusion into a state program and this program would then be submitted to the Corps of Engineers for approval (page 15, Sec. 1.05). Since the Corps has a 1980 proposal it is apparent that part of the program has been conducted in a manner contrary to that described by the Corps of Engineers. What are the esponsibilities and obligations of the local sponsors, DOE, and the Corps of Engineers? Who assumes liability for the program? Who makes the decision about which treatment method to use in a specific area? What criteria will be used to determine which treatment methods will be used in each specific area? (35)

Response: In August of 1977, WDE requested the Corps to establish a milfoil prevention and control program for Washington State. They stated "The importance of acting quickly in a milfoil prevention and control program has been discussed, and we would recommend that action be taken to expedite the review process so that the prevention and control program can begin." They agreed to act as the statewide sponsor for local milfoil control programs and to actively seek local sponsors to contribute 30 percent matching funds.

Because of WDE's request for immediate action, the local governments reluctance to make treatment proposals before the completion of the METRO study, and the need for specific treatment locations to establish the cost-share program, we identified the areas experiencing the most significant recreational obstructions on Lakes Washington, Union, and Sammamish and analyzed them for possible impacts which would occur from the treatment of milfoil. A local sponsor, either the state or a local government, must agree to supply matching funds before any of the identified areas are treated. Areas not identified in our treatment proposal can be proposed for treatment in 1981 and could be included in our annual program supplement. The responsibilities of the local sponsor, be it state or local government, as stated in the authorizing legislation, are as follows:

- Hold and save the United States free from claims that may occur from prevention and control operations.

- Provide 30 percent of the cost of prevention and control operations.

The Department of Ecology will be responsible for coordination with local sponsors, insuring compliance of proposals with established program criteria, cooperating with the Corps for program evaluation and monitoring of chemical treatment, and general oversight of the statewide program.

The Corps will prepare an annual program supplement outlining the ensuing year's work, annually evaluate the state-of-the-art for prevention and control by reviewing available literature and monitoring ongoing research, establish a program evaluation plan for effectiveness and cost, and provide general administration of the entire program.

The responsibility for the actual treatment would be with the local sponsor. The local sponsor would also designate treatment areas and treatment methods to be used, and develop a public awareness plan.

The criteria for selecting a treatment method would be up to the local sponsor so long as the proposal is within the framework established by the EIS. Onsite conditions including, but not limited to, salmonid use, water currents, degree of public use, public concern, and proximity to water intakes will be considered in treatment method selection.

Comment: Section 1.03.1. This section gives the distribution of Eurasian watermilfoil in Washington State and cites Figures 2 and 3. Figure 3, the map of Central Washington, contains some inaccuracies in its depiction of the Bureau of Reclamation's Columbia Basin Project main irrigation channels. The Project is preparing a map showing the correct location of waterways and infestations. It will be sent directly to the Corps of Engineers, Seattle. In addition, two small infestation sites in the Project area are not shown; these will be added. The following information is given in case additional explanation regarding the Project infestation is desired in the statement. At the present time Eurasian watermilfoil has been identified at seven separate sites on the Columbia Basin Project. The largest of these in Banks Lake. The others are: Billy Clapp Lake, Winchester Wasteway, Stan Coffin Lake, Evergreen Reservoir, Scooteney

Wasteway, and Scooteney Reservoir. Of these latter six sites, only Stan Coffin Lake and Evergreen Reservoir have well established infestations. The others have been limited to minor or transient infestations by winter season water level drawdowns which have had adverse effects on the plants. For example, even though a few watermilfoil plants were found in Billy Clapp Lake and Scooteney Reservoir in 1978, none were found during examinations in June and August 1979. The Columbia Basin Project has operated a survey program since 1977 to maintain surveillance of known infestations and examine Project waterways, ponds, and reservoirs for new infestations. Acreage estimates for each site can be furnished if desired. (36)

Response: Figure 3 has been revised to incorporate your latest input.

Comment: The statement should include information on typical ground-water conditions relative to the interrelationship of the ground and surface water regime so that the potential for ground-water recharge from treatment areas can be evaluated. (36)

Response: We anticipate no change in ground-water recharge in the treatment areas due to the proposed program.

Comment: There is a possibility for misunderstanding of the applicability of the control program to the infestations on the Columbia Basin Project. As stated above, Section 1.03.1 mentions that there are infestations in eastern Washington. The reader is referred to Figure 3 which is the map of Central Washington. The Bureau's infestations are flagged on it.

Section 1.05 discusses the proposed treatment areas for 1980. Though there is no discussion of plans for the Columbia Basin following the specific plans for each area in western Washington, we believe the causal reader may assume that the program will also be applied to the Reclamation infestations. It is not until Section 3.01, Federal Projects, page 46, that it is stated the program is not applicable to water areas of projects of the Corps of Engineers or other Federal agencies. Later, in Section 6.02.1, within Alternative Scopes of Treatment, page 68, item (4) also states that the subject Management Program cannot be applied to the infestations under jurisdiction of the Bureau of Reclamation. In order to avoid any misinterpretation, we believe this distinction should be explained earlier in the statement. Section 1.05, Proposed Control Program, should be amended to explain clearly that the Columbia Basin Project infestations are excluded and will be handled by the Bureau of Reclamation within its operation and maintenance responsibilities. We attach a copy of a newspaper article from Wenatchee World dated July 24, 1979, which illustrates this point. The third paragraph states that "the Corps of Engineers also is proposing to attack colonies of the water plant at five spots in the Columbia Basin: . . . ." (36)

Response: Paragraphs 1.02 and 1.03.1 of the final EIS have been expanded to state that existing Federal project areas cannot be included as part of the Corps' proposed Aquatic Plant Management Program.

Comment: Section 1.07.2 - Discussion of chemical control does not include any provision for removal of treated aquatic vegetation decomposing in the water. Some treatment areas could have a greater persistence time for detectable levels of herbicides than those reports or some closed water systems (59 days) and sediments (37 to 161 days) following treatment (appendix A, page A-2). Removal of decomposing vegetation, especially from treatment areas which also may be subject to herbicide drift, should be considered. (36)

Response: Milfoil treated with herbicides falls to the bottom and decomposes. Although removal of the decomposing vegetation would decrease adverse environmental impacts, we are not aware of any available technique or equipment which would do the job. Chemical control would be done early in the growing season whenever possible to prevent decomposition of large amounts of biomass.

Comment: The Seattle District is to be commended for the flexibility it has shown in allowing local sponsors to choose from alternative control techniques. We feel that this feature of the program's design reflects a sensitive recognition of local needs and concerns. It is also hoped that the Corps will recognize that local governments need to have some flexibility in designing that portion of the control program which will comprise the local match. For example, we believe that plant control undertaken at public expense on public beaches and in non-navigable waters should be considered as eligible activities for purposes of providing local match. We believe this would facilitate the establishment of an areawide program. Such a program may be the only manner in which this problem can be addressed in a comprehensive and equitable way in either navigable or non-navigable waters. (38)

Response: The Seattle District, at this time, can participate in funding treatment of nonnavigable waters only if those waters provide a direct threat to infest navigable waters. The King County lakes do not threaten uninfested navigable waters.

Comment: The public Brochure of the Aquatic Plant Management Program, published in August, states on page 15, that the non-Federal sponsor must agree to hold and save the United States free from claims that may occur from control operations. Although such a "hold harmless" clause may be commonly included in grant agreements prepared by the federal government, it should be recognized that the use of herbicides as a control operation produces a particular problem. The conditions and restrictions concerning the herbicide label are Federal requirements and the license for herbicide application and control are State responsibilities. It therefore appears unfair to ask or require the local government sponsor to assume liability for actions and their implications which are clearly beyond their control. It is hoped that special consideration will be given to this concern so that herbicides aren't eliminated as a potential control technique solely because of a legal technicality. (38)

Response: The "hold harmless" clause is a requirement of Federal cost-share contracts. The local sponsors have the option to use the nonchemical treatment alternatives if they feel they cannot accept the responsibility of chemical treatment.

Comment: Section 3.03.1, Page 46, recognizes that structural methods of aquatic weed control may require Substantial Development Permits as defined by the Shoreline Management Act of 1971. The application of herbicide for weed control also imposes restrictions upon public use of treated areas. Therefore, King County and other jurisdictions require substantial development permits for herbicide application. (38)

Response: Section 3.03.1 has been revised in the final EIS to indicate that some local governments are requiring substantial development permits for herbicide application.

Comment: Portions of the technical discussion on herbicides appear to need expanding and clarification, particularly with respect to section 4.06.5.2 on page 57. The statement that endothall, casoron, and diquat toxicity to fish is dependent upon chemical formulation and the species of fish is not questioned. However, the statement that "no fish kills due to toxicity of the chemical should result from concentrations used to treat milfoil" is misleading. Elsewhere, the statement is made that "dimethylamine salt of endothall is not recommended for use against milfoil in Washington because of its high toxicity of fish" (page 65, section 6.01.6). In addition, fish kill can result from concomitant stress and oxygen depletion in areas that have been treated with herbicides. (38)

Response: The endothall formulation recommended for use in the aquatic plant program is dipotassium salt (see paragraph 1.04.5.2 of the final EIS). The dimethylamine salt formulation of endothall is much more toxic to fish and, therefore, has not been recommended.

Although we expect no fish kills caused by oxygen depletion in treated waters, the possibility of such an impact is discussed in paragraph 4.06.5.2 of the final EIS.

Comment: Your letter of 17 October 1979 made available to us a document identified as "a draft copy of the aquatic plant management program design memorandum for the State of Washington." The document carries an October 1979 date and your letter indicates that it was prepared after the public hearings of early September 1979. Your letter also invites further comments on the draft environmental impact statement (EIS) for the same program, if they can be provided by 26 October 1979.

This letter constitutes our further comments. These comments are, of necessity, very brief and cannot be considered to be more than partially representative of some of our major concerns about the process to date, the draft EIS, and the design memorandum. We note that the design memorandum is approximately one inch thick. Regardless of

content, it is inappropriate to provide citizens with a document of such bulk and then allow them only slightly more than one week to review it and submit comments about it in relation to another document. In this case, since the material involves a project with somewhat complex ramifications and appears to be part of the foundation for statements made in the draft EIS, we feel that what has occurred may very well be a fatal flaw in the normal public review process for a draft EIS.

Comment number 21 in G.M. Zemansky's letter of 10 August 1979 (commenting as a private citizen on the draft EIS) noted that the "benefit/cost analysis" presented in the draft EIS was in fact an unsupported assertion rather than an analysis. According to the draft EIS the methodology and derivation (i.e., the entire technical rationale) for the benefits and costs was "included in the Design Memorandum." Obviously, it was not in the draft EIS even though such information was critical to determination of the basis for and the validity of the limited information in the draft EIS. In response to Mr. Zemansky's freedom of information request, James F. Walsh (District Counsel for your office) sent an "(un)staffed" and "(un)approved" version of the design memorandum with an August 1979 date on the cover. Mr. Walsh's letter of 29 August 1979 was the cover letter and the notation on the document itself was made on 31 August 1979. That document was sent to Alaska and, due to mail delays, was not received until October 1979. We note that there are significant differences between the August and October 1979 versions of the design memorandum (precisely what all the differences are we cannot say since we have had insufficient time for review) and that neither document was made available to the general public during the announced public comment period for the draft EIS. As far as we know, Mr. Zemansky was the only citizen who managed to obtain a copy of the August 1979 design memorandum and in his case the document was obtained after the close of the draft EIS public comment period (i.e., in October 1979) and only as a result of a freedom of information request. This despite the fact that other citizens and agencies recognized the critical importance of the design memorandum with regard to the draft EIS, had requested copies of it, and had been promised copies of it. For example:

1. As stated in Rodney G. Proctor's comments on the draft EIS for the Municipality of Metropolitan Seattle (METRO) of 3 August 1979 -

"The DEIS frequently refers the reader to the Design Memorandum for more detailed and specific data or explanations concerning major elements of the proposed control program and its impacts. The Design Memorandum is not included with the DEIS and it is our understanding from discussions with COE staff that it will not be available for public review prior to the end of the public review period on the Draft EIS. However, review of the Design Memorandum is necessary to more clearly understand such elements of the program as the basis for the cost/benefit analysis, the process proposed for selection of control methodologies, the criteria

proposed for selection of control areas and the proposed system for prioritization and funding of site-specific control programs in subsequent years."

2. As stated in Tom Eckman's comments on the draft EIS for the Cascade Chapter of the Sierra Club of 5 September 1979 -

"The cost/benefit analysis hardly deserves the name, it is so lacking in substance. We are told that more data is contained in the Design Memorandum, but this document was not available to the public for review during this comment period. How are citizens and elected officials to make competent choices when the information they need on which to base those choices is not available?"

3. As noted by Wilma Anderson in her comments on the draft EIS for the Seattle Audubon Society of 13 September 1979 -

"We were promised a copy of the Design Memorandum; however, at this writing it has not been received."

4. In his comments on the draft EIS of 14 September 1979 for the Northwest Office of Friends of the Earth, Michael McPhail notes the importance of the Design Memorandum, its unavailability to the public, the necessity of law that it be available to the public, and requests "that a formal public comment period be established for the Design Memorandum."

We do not consider that the present situation is responsive to that request. We would like to know precisely what was the distribution and the time frame of distribution of both the August and the October 1979 versions of the design memorandum to members of the public and involved government agencies. (39)

On October 18th the Army Corps of Engineers' Design Memorandum was hand delivered to me with your letter of request for further comments on the Draft Environmental Impact Statement. These comments were requested by October 26th.

There appear to be several changes from the DEIS to the DM; especially on cost/benefit analysis.

At our meeting with you, Col. Moraski, Bob Rawson and Ron Bush on October 12th, we were told that the DM was being revised considerably ("beefed up") over the DM referred to in the DEIS. Nevertheless, we have never seen the original (draft) DM. It was not available to us during the DEIS comment time although we requested it verbally at the public hearing and in our comment letter because points of the DEIS were vitally dependent on that DM.

Now the DM revision comes with a one week review time. The DM revision is virtually a revised draft of the DEIS - or at least a very vital part of it. One week is woefully inadequate time for review, and it is surely not in the spirit of NEPA. There simply is

inadequate time for us to evaluate this Design Memorandum; especially to compare it to the DEIS, find the changes, re-evaluate them and comment in depth. We would suggest that the entire Draft EIS be rewritten as one unit and resubmitted for public comment. (41)

Response: The August 1979 version of the Design Memorandum (DM) was not released for public review with the exception of the copy sent to Mr. Zemansky. The October 1979 version was sent to Friends of the Earth, the Seattle Audubon Society, METRO, King County, and the Washington Department of Ecology on 17 October 1979. The purpose of providing the DM was to allow review of our benefit/cost analysis. The basic program, as presented in the draft EIS, has not changed except for the addition of monitoring, program evaluation, and treatment priorities. We believe that adequate time was given to review those additions as they are presented in the DM provided for your review.

Comment: Page 1-5 -(of the design memorandum) - Waterways Experiment Station (WES) Large Scale Operations Management Test (LSOMT). As a result of our request to Colonel Moraski on 12 October 1979 you sent us a "working draft" of the LSOMT "test plan" which was received on 17 October 1979. Although we have not had sufficient time to review that document in depth yet, we note that the purpose of that three year "study" which commenced this summer is "to evaluate the concept of prevention as an operational technique for managing problem aquatic macrophytes in the Seattle District." It is further stated in that document that the WES has:

> "discovered that not enough is known about aquatic macrophyte establishment and spread to design an operational prevention plan, nor are sufficient data available to confidently determine the magnitude of the potential Eurasian watermilfoil problems in the navigable waters of the State of Washington."

In view of the above statement, it seems inappropriate for your agency to even consider a "prevention" program at this time let alone include such a program under the coverage of a draft EIS for near-term implementation. This problem is highlighted by other deficiencies in the draft EIS regarding the "prevention" program in the Columbia River drainage. Mr. McPhail's letter for the Northwest Office of Friends of the Earth on 6 September discusses this situation. (39)

There is some confusion regarding the part of the Large Scale Operations Management Test (LSOMT) in the state milfoil management program (1-5). If the purpose and scope of LSOMT is to obtain data to evaluate a concept, how can the local Corps be proposing to put these conceptual methods into immediate use before said evaluation? (41)

Response: The beginning of the quote from the LSOMT is "In preliminary analysis of the potential of using prevention as a method of managing aquatic macrophytes, it was discovered..." One of the first tasks of the LSOMT was to survey Washington waters to determine the

potential for milfoil growth. This survey was completed in October 1978. The results were utilized in the design of the first year Aquatic Plant Management Program. We recognize that these results are preliminary and as more information becomes available the design of our program may change in future years. The working draft of LSOMT, discussing aquatic plant problems in other parts of our country, also states "In nearly all cases, the troublesome species that now occupies large areas and requires frequent and costly treatments, could have been prevented from reaching the problem level at comparatively negligible cost, had proper attention been given when the pioneer colony was first observed." The emphasis of our proposed prevention program is on early detection and spot treatment of pioneer colonies with control measures known to be effective. New techniques or refinements developed by the research program would be incorporated into the program. Mr. McPhail's comments concerning the Columbia River previously were addressed.

Comment: Pages 4-20 through 4-22 (of the design memorandum) - Chemical control impact assessment. The presentation is facile and totally inadequate. No documentation to support various claims is given. Problems such as toxicity to salmonids are downplayed with qualifications that attempts will be made to "avoid high-use areas during spawning, rearing, and migration." Besides problems in the identification of such areas (limited by the rather imprecise state-of-the-art of the biological sciences), such areas were not identified in the draft EIS or the design memorandum (only general reference is made to such areas and the presence of salmonids in various areas proposed for treatment in the U.S. Fish and Wildlife Service letter of 2 July 1979 under George L. Capp's name and appended to the design memorandum), there is the question of drift, which is also not dealt with in those documents. Furthermore, various important aspects of toxicity such as interference with smoltification are not discussed. The absence of information is defended with the statement on page 4-22 that "Chronic toxicity should not be a problem." Data to positively support that statement are simply not presented (a general failing of both the draft EIS and the design memorandum). (39)

We remind you of our concern about herbicide impact on wildlife - an area not addressed in the DM. (41)

Response: The impact assessment included in the design memorandum is a summary. A detailed evaluation of the environmental impacts associated with chemical treatment is contained in the final EIS, Chapter 4. Information regarding chemical toxicity has been further expanded in appendix C of the final EIS.

Comment: Appendix A (of the design memorandum) - "Detailed cost estimates." First of all, the information on costs presented is totally unsupported. What is the basis of the numbers given? No references are listed, although it appears that enough of the assumptions are explicitly stated to determine how the calculation was made once numbers were picked. What is the basis for stating that harvester rental amounts to $480 per acre? Total harvesting costs in

other parts of the country and Canada have been far less than that amount which assumes two cuttings and a per acre cost of $240 per cut. Similarly, disposal costs are unsubstantiated. Local administration, Washington Department of Ecology (DOE) and Corps management costs total $310 per acre, or about double the high cost in eastern Canada when contracted out to a profit making firm...just for administration here? In the case of chemical treatment, there is an unexplained and significant variation in local administration and DOE costs. Local administration costs which were stated to be $40 per acre for mechanical harvesting are $20 per acre for all of the chemical methods while DOE costs of supervision vary from $155 to $205 per acre ($155 for the purported "low cost" 2,4-D granular BEE formulation) for the various chemical methods as compared to $190 for mechanical harvesting. Why? Does it really cost less for local administration and DOE supervision of a 2,4-D BEE program than a mechanical harvesting program? Corps management costs seem to stay the same in all cases. Furthermore, we are skeptical of the acutal costs cited for 2,4-D BEE application per acre and in view of the fact that chemical treatment efficiency (as demonstrated in Lake Washington this summer) may be so low as to require two treatments it would probably be appropriate to specify that two treatments are necessary in defining costs. There is as much a possibility that only one harvesting and two chemical treatments might be required to accomplish the job as the other way around which you have assumed. On that basis, using your numbers with the assumption that two treatments are necessary and that program administration costs at least equal those with harvesting an estimate of $660 per acre is obtained for 2,4-D BEE, your "low cost" method. With regard to fiberglass bottom screening, we also question the basis of your numbers. In particular, why is the cost of DOE supervision so high ($840 per acre) and why wasn't the fact taken into consideration that the bottom screens may last ten to fifteen years and that therefore their costs must be amortized over that time frame to arrive at a comparitive annual cost? Using the low end of that scale and crudely dividing the total by it and adjusting the DOE supervision and local administration costs to those of mechanical harvesting a per acre cost of $1,300 per acre is calculated (the low end estimate yields a high end cost estimate that might actually be substantially lower). Although the Corps' proposed monitoring and evaluation program is not discussed and therefore cannot be evaluated, it is reasonable that it is much higher for chemical methods than for non-chemical methods and it may even be more lopsided than is shown given the Corps' bias. Accepting the Corps' figures of $33,000 and $3,000 respectively chargeable to chemical and non-chemical methods the per acre cost for each in this 100 acre program is $330 and $30. Using the Corps' "low" and "high" cost assumptions (i.e., 2,4-D BEE over 100 acres as opposed to mechanical harvesting of 90 acres and bottom screening of 10 acres and using the Corps' evidently high mechanical harvesting figure and our adjusted chemical figure) the comparison is as follows:

Mechanical Harvesting/Bottom Screening -	$96,100
Chemical (2,4-D BEE) -	$99,000
Excess Cost of Chemical Over Non-Chemical -	$ 2,900

In other words, it may very well be that a well run program of mechanical harvesting and bottom screening would result in substantial savings of public monies in comparison to the lowest cost herbicide alternative. (39)

According to the information contained in Appendix A, costs for each treatment method are based upon the following: October 1979, price levels, including contractor's cost; administrative costs of local government; DOE supervision and COE management. It is tempting to compare the per acre cost estimates, but this is difficult to do for a number of reasons: front end costs have not been amortized, nor have annual costs been projected into the future; the local administration costs are probably optimistic and too low; the DOE supervision costs, however, seem unreasonably high for some control techniques; and the monitoring and evaluation costs were not included.

It is unclear why the per-acre costs of DOE supervision vary so much for each treatment method given, especially since local administration and COE management costs remain constant. We are particularly interested in the basis used for the cost of DOE supervision for the use of fiberglass bottom screen (i.e., $840/acre).

In addition, the distinction between DOE Supervision/COE Management and Program Evaluation and Monitoring is unclear. Although separate costs are given for each of these program elements, the program aspects for each of these activities are not well defined. The local sponsor(s) may want to be actively involved in the design and performance of the work. (40)

We believe that the question of milfoil/aquatic plant control should be based on alternatives that have least impact on the environment - including the human environment. It is our assessment that the DM concentrates on justifying herbicide use; especially 2,4-D. In our opinion, the cost-benefit analysis epitomizes this point. For example:

- The bottom line for 2,4-D does not include monitoring costs, costs of providing alternate irrigation and/or drinking water sources or the possibility of need for second applications.

- The bottom screening cost includes the total price of the item as a first-year cost. What is the second and subsequent years' costs when these items are paid in full? Why aren't these purchase costs amortized over the expected life of the screen? The bottom line does not include the fact that the city of Seattle has already purchased screens for several beaches. This would reduce the cost figures in the EIS.

• The mechanical harvesting bottom line does not include the potential for selling the harvested plant. When doubling the 2,4-D lowest cost figure - which might be realistic if 2 applications were required due to adjusted application time for fish - then the total is almost exactly equal to the figure shown for mechanical harvesting.

• What is the justification for the difference in administrative costs for chemical and other methods? Why would the local administrative costs for mechanical harvesting be exactly double the cost for any others?

• Is it realistic to have a $900/acre bottom screening contingency when mechanical harvesting has $50/acre contingency and the herbicides vary from $35 (2,4-D) to $165/acre? What is the basis for these figures?

• If the Corps is the co-funding agency, the Department of Ecology is the umbrella agency and the local agency does the administering, and if the monitoring and evaluation figures are separate (A-4), then what explains that the local and Corps costs remain the same for all methods while the Department of Ecology varies from $155/acre (2,4-D) to $840/acre for bottom screening? (41)

Response: The costs presented in appendix A are based on October 1979 price levels for the Seattle area. The cost of the mechanical harvesting is based on the rental rate, quoted by the owner for the only known harvester available in the Seattle area. Because of the number of variables, the disposal costs can only be estimated.

The state and Federal administration costs assume one full man-year effort for WDE and the Corps. The time for each agency would be split between the control portion of the program and the prevention portion. The time spent on the control portion would be charged to only 100 acres. If the number of acres treated increases, the administration cost per acre would decrease.

The amount of WDE administrative cost varies for the different control methods because it includes 7 percent of the monies passed through to the local governments. The local administration cost is only an estimate. The estimate for mechanical harvesting is twice that for the other methods because of the need for two treatments per year.

The assumptions of the number of treatments required per year is based on performance of these control methods in other aquatic plant control programs but would be subject to review during our program evaluation.

The capital cost of fiberglass bottom screens was not amortized because our proposed program covers only fiscal year 1980 and all costs must be paid in that year. Since the bottom screening is no longer available as rental in the Seattle area, the entire capital

cost, installation, and maintenance was included in the cost per acre. It is noted in paragraph 1.04.6 of the final EIS that the costs for years beyond 1980 would be based only on maintenance for the remaining life of the screen.

The costs for monitoring and evaluation of the program have been added into the cost per acre of the various control methods (refer to chapter 1 and appendix A of the final EIS). The contingencies were based on a percentage of the cost per acre and are therefore more for bottom screening.

Comment: Appendix B (of the design memorandum) - "Detailed benefit analysis." As already stated, the information to determine city of Seattle beach impacts and therefore benefits doesn't appear to exist. In any case, it would appear to be immaterial unless the Corps is proposing to pay the city for the bottom screens which it has already purchased and successfully used. Similarly for Lake Sammamish State Park, whatever problem there is at that location doesn't appear to be related to milfoil at this time. Therefore, the very large benefits which are estimated to be the result of control program action at Lake Sammamish State Park (about 82 percent of total control program estimated benefits) and the city of Seattle beaches (an additional 6 percent) are essentially non-existent. Further comments are hardly necessary with regard to the meaning of that. It is noted that there has been a substantial change in benefit estimation since the August 1979 draft of the design memorandum. At that time a figure of 100 percent reduction was used in the event of no control program. In the October 1979 version, a figure of 50 percent reduction was used. Therefore, the estimated benefits vary accordingly for those situations. Accepting the Corps' figures for the other beaches as given in the design memorandum yields benefits attributable to the control program at them of $70,308. Having insufficient time to further evaluate that situation we will proceed. In the design memorandum benefits from a control program for areas which are not public beaches are in terms of purported "willingness to pay." Who would pay for what? Insufficient information is given in the design memorandum or the draft EIS to determine precisely what the benefits are and equally importantly from a public policy standpoint how they would be distributed. Benefits for the prevention program are equally suspect. Benefits are claimed for the Columbia River basin almost all the way to the Pacific Ocean. Previous comments herein with regard to the LSOMT and the likely potential distribution of milfoil are relevant.

In summary with regard to benefits and costs, the information in the given design memorandum and the draft EIS is inaccurate, misleading, and insufficient with which to complete the calculation of a usable benefit-to-cost ratio. With the available information and given the time constraints we have been working under, it would appear that the costs of the lowest cost chemical method are more than the costs of a reasonable mechanical harvesting-bottom screening alternative and that the benefit may or may not be greater than the costs but if they

are greater it is not by very much (for a control program). The presentation of both benefits and costs in the design memorandum and the draft EIS for a "prevention" program appears to be more in the realm of fantasy than anything else and, in our opinion, is unusuable. Furthermore, in any chemical control program any possible recreational benefits would have to be adjusted downward to reflect loss of recreational opportunity to safety restrictions against use and entry. (39)

Although at our October 12th meeting we were told that the Corps has the Metro Macrophyte study indicating rise and fall of milfoil growth in different locations, that knowledge is not reflected in the control proposal for Lake Sammamish. Additionally, we direct you to the Metro finding this year in the demonstration-research project that there was not enough milfoil in lower Lake Sammamish to justify harvesting, and that what was there was not in a location to impact recreation. (41)

Response: The Seattle Department of Parks and Recreation and the Washington State Parks and Recreation Commission have indicated to us that the public beaches proposed for treatment are in fact obstructed by milfoil during the recreation season. Cost-share funding could be used to maintain any bottom screens now owned by the city of Seattle or to expand their usage.

The possible reduction of recreational activity in the absence of a milfoil control program would be variable and site-specific. 100 percent loss did occur at Steamboat Rock State Park on Banks Lake in the summer of 1978. We do not believe that the impacts would be as great at all areas. The 50 percent loss figure was used in order to avoid over estimating benefits.

The boating benefits are derived from the "willingness to pay" concept and are based on the willingness of waterfront property owners to assume the expense of milfoil treatment in the navigable public waters fronting their property. While these areas are not adjacent to publically owned lands, they are public waters and available for use by the general public.

Based on estimates of potential milfoil growth in the Columbia River, the prevention program would be protecting the loss of recreational use of public beaches along the entire river.

The loss of recreational opportunities caused by chemical treatment would be insignificant in comparison to the recreation loss caused by untreated milfoil in public beach areas.

Comment: Colonel Moraski's letter of 12 October 1979 fails to provide answers to the questions asked by Mr. McPhail in his presentation of 4 September 1979 at the public hearing in Seattle. The responses politely side-stepped the questions or provided information which we feel is insufficient to address the problems raised by the questions. (39)

Response: In each response provided in the 12 October 1979 letter, information was presented upon which assumptions or analysis were based in developing the proposed management program. Where data is lacking, we have made assumptions based on available research and experience with milfoil. As additional data becomes available, we will update and modify the program accordingly through an annual program evaluation.

With the information provided in the 12 October 1979 letter, and the program information provided in the draft EIS, the DM, and now the final EIS, our intent has been to fully and adequately address your questions and concerns regarding the proposed Aquatic Plant Management Program.

Comment: Via our freedom of information request of 26 September 1979 we obtained copies of several very pertinent documents from the Corps. One of these is the memorandum of 29 August 1979 of David Chawes and Judith Petersen and the attached enclosures regarding public health risks (primarily carcinogenicity and teratogenicity of 2,4-D is discussed) and monitoring/public notification/employee safety requirements. Quoting from those documents:

> "Many of the statements (in the draft EIS) concerned with the teratogenicity and carcinogenicity of 2,4-D are inaccurate, incomplete, and/or inadequately referenced."
>
> "It is the opinion of the industrial hygienists for the Seattle District and the North Pacific Division that the U.S. Army Corps of Engineers should not be a proponent of the use of 2,4-D as a means of aquatic plant control in waters used by the public for recreational and agricultural purposes."
>
> "Strong evidence exists that 2,4-D causes birth defects in animals and there is accumulating evidence that it also causes cancer. The EIS does not adequately address the possibility of adverse public health effects resulting from the applications of 2,4-D to public-use waters." (39)

As noted in a Seattle Post-Intelligencer editorial on 15 October 1979, it is obvious that the Corps has been a proponent of 2,4-D use for some time. The Corps has made no secret of that and everyone is aware of it. The question is why? Particularly in the face of solid and growing scientific evidence and empirical correlations that 2,4-D poses a serious public health risk and that there are economically viable alternatives. If the Corps doesn't take the recommendations of its own Safety Office industrial hygienists on what authority does it rely for decision making evaluation with regard to public health risks?

Furthermore, the Safety Office industrial hygienists have also raised important questions with regard to monitoring, public notification, and employee safety. Besides the fact that it is a label violation

to put toxic chemicals like 2,4-D into the water supply (i.e., water used for irrigation and domestic purposes) that the lakes involved are, what about the health of those persons effected and the protection of the aquatic environment? There is no indication in either the draft EIS or the design memorandum that the Corps is willing to take steps to even identify lake water users like Mr. and Mrs. Favro let alone measures to protect their health and comply with the minimum legal requirements relating to such situations. (39)

There is growing public concern about the over-use of herbicides, and 2,4-D is the subject of much current conversation on this topic. This is evidenced by the in-house memorandum from the Corps' own industrial hygienists cautioning against the use of herbicides in the aquatic plant management program. (41)

Response: The Corps' industrial hygienists have had direct input into the preparation of the final EIS. Because of their input and public response to our proposed program, a chemical monitoring program has been added in order to limit public exposure to 2,4-D. The possible public health impacts associated with our proposed program were addressed in greater detail with scientific references cited in the final EIS. Provisions have been made to provide alternate sources of water where necessary, and provisions for employee safety have been added to the draft contract between the Corps and the State Department of Ecology. Further, a requirement of any chemical control contract would be extensive public notification and identification of any domestic water intakes. Prior to chemical application, a permit would have to be obtained from the Department of Ecology to assure that label restrictions would not be violated.

2,4-D is not the only method of milfoil control acceptable to the Corps. Every proposed treatment area has some non-chemical alternative which is feasible and available.

Comment: It is unclear in the DM whether the COE intends to allow local sponsoring agencies the flexibility to propose other areas in selected water bodies for treatment in 1980. The benefit analysis indicates that other areas could benefit from milfoil control based on recreational usage. The COE DEIS contains the general statement that "economic justification for the control program is based on the prevention of recreation loss (swimming and beach activity) for the public areas to be treated," (page 28) and implies recreational benefits were the primary criteria for selecting areas in Union Bay for control.

However, regarding the shoreline areas in Union Bay selected for control, the DM states that "the selection of a 100-foot-wide channel width is based on the objective of providing adequate navigation access while minimizing environmental impacts."

Since the shipping navigational channel does not require control, it seems that the primary treatment area selection criteria for Union Bay is to promote recreational navigation and restore areas to usage

levels desired by the public. The present proposal for Union Bay would not fully restore recreational use of the area, nor does it propose a channel all the way along the shoreline to facilitate circumnavigation of the bay. We would appreciate a better understanding of your specific criteria for identifying only these 17 acres. (40)

Response: Recreation benefits are the only benefits which can be assigned a dollar value and are therefore the basis for our economic analysis. Some changes could be made in the proposed treatment areas if they were minor. Major changes would require a supplement to our EIS. The specific areas in Union Bay were proposed on the basis of shoreline development and other recreation use. Circumnavigation related to milfoil problems was not identified as a need during program formulation and therefore was not studied as an objective of our 1980 Aquatic Plant Management Program.

Comment: Metro staff understands through conversations with COE staff that the COE will consider control methodologies other than those specifically recommended for each area. For example, in Union Bay "Aquascreen" might be considered another fundable control methodology if certain criteria yet to be defined by the COE are met. Metro staff will continue discussions with the COE to clarify this issue. (40)

Response: As with the proposed treatment areas, minor changes in treatment methods could be made if they do not result in significant environmental impacts that are not already addressed in the EIS. Major changes (i.e., aquascreen over a large number of areas) would require a supplement to the EIS.

Comment: Regarding the COE recommendations to use 2,4-D in Union Bay, it is unclear whether 2,4-D was recommended over other control chemicals based solely upon its selectivity to control milfoil. If this was the reasoning, please note that according to preliminary information received from the literature review conducted as part of the Union Bay project, non-target plants can be destroyed by applications of 2,4-D if application rates for milfoil control are exceeded. (40)

Response: One of the reasons 2,4-D was considered more acceptable for use than other control chemicals in some areas is because of its selectivity to control milfoil. Contracts with chemical applicators would specify specific rates and techniques that must be used.

Comment: In reference to Table 3-2, Alternative Treatment Methods, in the DM, we offer the following information on harvesting and use of Aquascreen based upon information obtained to date from our Union Bay project.

One of the disadvantages given in Table 3-2 for harvesting was that plant regrowth is stimulated. Initially, the process of harvesting may stimulate growth; but over time, the process eliminates plant nutrients from the water system and allows for effective control.

With regard to Bottom Shading (e.g., Aquascreen), our data indicate that it is 100 percent effective immediately upon application at the beginning of the growing season. Difficulties in anchoring the material may be minimized if placement occurs early in the season prior to extensive macrophyte growth. Lifting of the screens by gas bubbles has not proven to be a problem because the screens are permeable. (40)

Response: Harvesting would have an impact on reduction of available nutrients only if more nutrients were being taken out than being introduced. The nutrient budget for the Seattle area lakes has not been analyzed.

Some problems with gas bubbles associated with fiberglass bottom screens were observed during the Union Bay study but could be reduced by earlier placement.

Comment: The disadvantage given in Table 3-2 for Bottom Shading is that swimming and boating activities could be limited during the treatment period. It should be noted that these activities would be limited only during the installation period. (40)

Response: Noted.

Comment: Application of any of the chemicals listed would involve slow-moving boats which "could interrupt or congest navigation routes during treatment operations," approximately to the minimal level created by harvesters. This should be so indicated in the Table. (40)

Response: This impact is expected to be negligible.

Comment: Prioritization and Funding of Site-Specific Control Programs

Neither the draft DM nor the DEIS answer all the questions about this new program, especially the management procedures. We recognize that many of the details remain to be developed, but we have these comments to add at this time.

The DEIS states that local sponsors will submit treatment proposals to DOE for inclusion into the state program. DOE, in turn, would submit the state proposal to the Corps of Engineers. The DM elaborates on DOE's role on pages 4 through 18.

Although we are considering a range of alternatives, one scenario we are considering would have a single agency in the Seattle metropolitan area perform much of this work and provide DOE with an annual list of site-specific treatment proposals. That list would be organized to reflect local priorities. DOE could then submit this list to the Corps of Engineers for funding considerations and the Corps program dollars could be allocated straight down the list, until the funds were exhausted.

We also suggest that DOE coordinate its periodic projections of milfoil growth with the local agencies as well as the Corps. Local sponsors will also need to be included with the Corps as receivers of the DOE results of the monitoring and evaluation program. (40)

Response: Close coordination on all levels of government will be necessary for the efficient operation of the proposed program. Paragraph 1.12 of the final EIS outlines our general priorities. The prioritizing of specific proposals within this framework would be coordinated between the Department of Ecology and the local sponsors. All information obtained from the program will be available for review.

Comment: We have attached a copy of our revised schedule. We look forward to the receipt of your final EIS for review and comment. (40)

10/25

UNION BAY DEMONSTRATION PROJECT

DECISION-MAKING STRATEGY & TIME FRAMES

TASK	TARGET DATE
Second cut with harvester	early October
Herbicide Literature Study • medical effects (done, need format) • aquatic environment	late October
Receive preliminary assessment of alternative control techniques from U of W consultant	late October
Receive final assessment of alternative control techniques from U of W consultant	November
Submit analysis of alternatives to Water Quality Committee with recommendations on control technique, lead sponsor and financing mechanism	December 13
Submit analysis of alternatives to Metropolitan Council with recommendations on control technique, lead sponsor and financing mechanism	December 20
Water Quality Committee makes recommendation to Council	January 10
Metro Council makes decision	January 17
Local agency accepts lead role (in accordance with SEPA)	February 1980

TASK	TARGET DATE
Lead agency -	March 1980

- applies for Corps of Engineers 70% cost-sharing program
- starts any permit processes necessary
- may contract for or buy any equipment, supplies, services that will be needed

Local agency ready to take action to control milfoil	April 1980

Response: Noted.

Comment: It is our understanding that Lake Sammamish is the sole source of drinking water for some residents, and also that for many it is the main source of irrigation water. How would an alternate source of drinking water be provided to these people? How would a community be notified of herbicide applications to either drinking or irrigation water supplies? Would the Corps apply 2,4-D (or any other herbicide) to a drinking water source without providing an alternate supply of drinking water?

Regarding the monitoring and evaluation of herbicides applied - we continue to have questions on how, who, when and what would be monitored. And what would be presented to the general public for assessment? (41)

Response: The draft cooperative agreement between the Corps and WDE requires that a public notification plan be developed including identification of domestic water intakes in the affected area. This, and the provision for alternate drinking water, would be the responsibility of the local sponsor. The notification plan would require the posting of signs at all properties adjacent to the affected area indicating what treatments were being done, the date and time of application, and the restrictions on water use.

Monitoring would also be the responsibility of the local sponsor in compliance with requirements of the Corps' program. The monitoring would stress determination of herbicide concentrations in the water column. Water samples would be analyzed by a qualified laboratory. The treatment and monitoring proposals would be subject to public review if required by local or state permit requirements. Evaluation of the herbicide applications could include studies of effectiveness, percent root kill, and selectivity for milfoil.

Comments: Although SAS committee members have not seen the written LSOMT proposal, it is rumored to include 2,4-D test plots in the Sammamish River. SAS wishes to go on record by calling for a FULL PUBLIC REVIEW PROCESS of any Corps proposal for herbicides in any Washington waters. (41)

Response: No specific proposals have been made for the testing of 2,4-D in the LSOMT. Any chemical treatment proposed would comply with all applicable laws including obtaining necessary permits and undergoing necessary public review.

Comment: We request that both this letter and our letter of October 14th be considered comments to the existing DEIS. (41)

Response: Your letters of 13 September 1979 and 26 October 1979 are included in our final EIS. We have no record of an EIS comment letter dated 14 October 1979.

Comment: Again we reiterate that SAS supports non-chemical methods of aquatic plant control. We cannot accept that this proposal be based solely on an economic justification (regardless of what the costs seem to say). (41)

Response: The benefit-cost analysis is required by law and is not the sole justification for the program.

Comment: Also you may be aware of the very recent declaration of restrictions on the use of 2,4-D in national forests and a policy to emphasize nonchemical methods of forest management to be put into effect by the U.S. Department of Agriculture. It is expected that these restrictions will be extended to other government agencies. (41)

Response: Noted.

Comment: As we have discussed, and as the DM points out, there are adequate non-chemical methods of aquatic plant control available now. We encourage the local Corps to conscientiously re-evaluate their proposed use of herbicides and consciously take the lead in proposing a program of aquatic plant control which emphasizes non-chemical methods. (41)

Response: Our program includes feasible non-chemical methods, as well as chemical methods, for each treatment area. Local governments have the option of selecting the method they feel is preferable from those we have identified as feasible and available for each specific treatment site.

Comment: We request that the text of our response be printed in your final environmental statement, as required by CEQ Guidelines. (42)

Response: Your input was considered during the planning stages of our study. Since your letter was in response to the information brochure rather than the draft EIS, however, your comments were not addressed individually in this chapter. Per your request your letter has been included in appendix E of the final EIS.

appendix a

COST ESTIMATES

APPENDIX A

COST ESTIMATES

TABLE OF CONTENTS

1. <u>Treatment Methods</u>. Costs for the various treatment methods are based on October 1979 price levels and include the contractor's cost, the administrative cost of local government ($2,000 per treatment), Washington Department of Ecology (WDE) supervision and Corps of Engineers management. The contractor cost does not include obtaining necessary permits. WDE administrative costs vary according to each treatment method because all pass-through funds are assessed 7 percent for WDE costs. Local administration and Corps management costs are estimated based upon the staff necessary to accomplish the work, including an allowance for overhead. The annual costs are based on the treatment of 100 acres.

The proposed program is for 1 year only. Even though there are provisions for continuing the program into subsequent years, all costs have been estimated based on a 1-year program. Accordingly, all program costs incurred are payable in the first year. For instance, fiberglass bottom screen is not presently available for rental in the greater Seattle area and, therefore, the full purchase price must be included in the first year costs even though the screen has a useful life of more than 1 year.

a. <u>Mechanical Harvesting</u>. The costs of mechanical harvesting are based upon the rental rate of available equipment in the Seattle area. The estimated per-acre cost is:

Harvester Rental1/	$480
Disposal Cost	50
Contingencies (10 percent)	50
Local Administration2/	40
WDE Supervision3/	190
Program Evaluation	30
Corps Management4/	80
Total Cost/Acre	$920

1/Cost for one treatment, which involves two cuttings during the growing season, includes labor, maintenance, profit, capitalization of equipment costs, and mobilization-demobilization.

2/Local administrative costs are $2,000 for 100 acres. In the case of mechanical harvesting, two cuttings are involved, so the total local administration cost is $4,000 for 100 acres.

3/40 percent of 1 man-year plus $1,000 travel plus 7 percent of pass-through funds.

4/20 percent of 1 man-year plus travel plus preparation of annual design memorandum supplement.

b. Rotovating. Rotovating would be used for spot treatments in the prevention program and a definite cost per acre was not estimated. Based upon the Canadian aquatic plant management program, costs in the range of $600 to $700 per acre, plus a capital cost of $50,000 could be expected.

c. Suction Dredge. Suction dredging would be used for spot treatment in the prevention program so a definite cost per acre was not estimated. Based on the Canadian program, costs in the range of $800 to $900 per acre, plus a capital cost of $12,000 could be expected.

d. Hand Removal. Hand removal of milfoil could be practical in areas of limited growth. In shallow water this can be accomplished by hand pulling with no special equipment; in deeper water it would require diving gear and specially trained personnel. The cost of this method, which would be based principally on labor and the cost of diving equipment, if required, would be entirely dependent on the situation. The use of this method would be minimal and very localized. No per-acre cost has been estimated because of lack of data and limited probable use of this method.

e. Chemical Treatment. For chemical treatment, the per-acre cost includes:

- one treatment boat with crew;
- one chase boat with crew (used to keep people out of treatment area);
- a four-man shore support crew (used for public notification and any necessary loading and unloading);
- the cost of herbicides;
- contingencies (including alternate source of domestic water supply and variations in chemical costs, labor, equipment, and monitoring and evaluation);
- Federal, state, and local administration and supervision;
- Aquatic plant community and water chemistry monitoring and program evaluation;
- Profit.

(1) 2,4-D (DMA Liquid). Liquid 2,4-D (DMA) would be applied at a rate of 5 gallons per acre in areas where the water depth is 4 feet or less, and 10 gallons per acre where the water is deeper than 4 feet. The per-acre costs are:

Chemical Costs	$100
Labor and Equipment1/	45
Contingencies (25 percent)	35
Local Administration	20
WDE Supervision	160
Monitoring and Evaluation	330
Corps Management	80
Total Cost/Acre	$770

(2) 2,4-D (BEE Granular). Granular 2,4-D (BEE) would be applied at a rate of 100 pounds per acre. The per-acre cost is:

Chemical Costs	$ 85
Labor and Equipment2/	55
Contingencies (25 percent)	35
Local Administration	20
WDE Supervision	155
Monitoring and Evaluation	330
Corps Management	80
Total Cost/Acre	$760

(3) Diquat. Diquat would be applied at a rate of 2 gallons per acre. The per-acre cost is:

Chemical Costs	$115
Labor and Equipment	45
Contingencies (25 percent)	40
Local Administration	20
WDE Supervision	160
Monitoring and Evaluation	330
Corps Management	80
Total Cost/Acre	$790

1/Labor and equipment costs are based on $3,000/day for labor, the rental of two boats at a cost of $64/day each, mobilization-demobilization of equipment, and a capability of treating 100 acres/day.

2/The treatment boat can handle 8,000 pounds a day. Based on the weight of chemical used per acre, the treatment capability would be 80 acres/day.

(4) Endothall (Liquid). Liquid endothall would be applied at a rate of 10 gallons per acre. The per-acre cost is:

Chemical Costs	$245
Labor and Equipment	45
Contingencies (25 percent)	70
Local Administration	20
WDE Supervision	170
Monitoring and Evaluation	330
Corps Management	80
Total Cost/Acre	$960

(5) Endothall (Granular). Granular endothall would be applied at a rate of 500 pounds per acre. The per-acre cost is:

Chemical Costs	$460
Labor and Equipment1/	210
Contingencies (25 percent)	165
Local Administration	20
WDE Administration	205
Monitoring and Evaluation	330
Corps Management	80
Total Cost/Acre	$1,470

(6) Dichlobenil. Dichlobenil would be applied at a rate of 150 pounds per acre. The per-acre cost is:

Chemical Costs	$435
Labor and Equipment2/	80
Contingencies (25 percent)	130
Local Administration	20
WDE Supervision	190
Monitoring and Evaluation	330
Corps Management	80
Total Cost/Acre	$1,265

f. Fiberglass Bottom Screen (Polyvinyl Chloride Coated Fiber-Glass Screen). The cost of fiberglass bottom screen is based on purchase and installation because fiberglass screen is not presently available for rental in the greater Seattle area. The per-acre cost is:

1/Based on the weight of chemical used per acre, the treatment capability would be 16 acres/day.

2/Based on the weight of chemical used per acre, the treatment capability would be 50 acres/day.

Fiberglass Screen1/	$9,900
Local Administration	20
WDE Supervision	840
Program Evaluation	30
Corps Management	80
Total Cost/Acre	$10,870

2. Program Monitoring and Evaluation. The costs estimated for evaluation and monitoring of the Aquatic Plant Management Program that are separable from local administration, WDE supervision, and Corps management costs are listed below:

	Low-Cost (Chemical) Program	High-Cost (Mechanical) Program
Persistence and drift tests to monitor chemical treatment at three sites.	$20,000	0
Percentage of root kill analysis from chemical treatment at three sites.	3,000	0
Selectivity of plant kill by transect analysis at representative treatment sites.	4,000	0
Program evaluation 2/.	9,000	$9,000
Contingency	4,000	1,000
Total Annual Costs	$40,000	$10,000

3. Prevention Program. Activities in the prevention program are undertaken to keep milfoil from establishing or reaching levels that obstruct desired usage. Generally, major effort is in surveillance because of the need for intensive and frequent collection of ground data supplemented by aerial reconnaissance. Spot treatment is minimal due to the small areas occupied by pioneer colonies. Following are descriptions of the work activities in each component of the first year prevention program.

1/Cost is based on a purchase and installation price of $0.21 per square foot and 10 percent contingencies.

2/Program evaluation includes a literature search for state-of-the-art information; treatment site selection evaluation; treatment method selection evaluation; and monitoring treatment methods in terms of cost, effectiveness, and public acceptance. Of the total $10,000 ($9,000 plus 10 percent contingency) for evaluation, $7,000 is chargeable to the prevention program and the remainder to the control program.

- Surveillance. This includes aerial photo missions, ground truth surveys to verify presence of suspected milfoil colonies, localized surveys of potential milfoil sources, and evaluation of data. $90,000

- Treatment. This includes spot treatment of pioneer milfoil colonies for the purpose of preventing movement to other areas where new colonies would be established. Treatment methods will be one of the following: rotovating, hand removal, suction dredging, fragment barriers, or 2,4-D. The primary prevention area is in eastern Washington (Osoyoos Lake, Okanogan River, and Columbia River). Specific areas to be treated have not been identified because the potential for spread has to be determined. However, the total area is estimated to be less than 20 acres. Operation and maintenance of fragment barriers on the Okanogan River at Oroville are also included. 30,000

- Public Awareness. All activities are directed to informing the public of the potential problems caused by milfoil and what actions can be taken to prevent milfoil from reaching major problem proportions in the state. Activities include public workshops, newspaper articles, brochures, signs, television and radio announcements, and special notices (e.g. in aquarium shops). 10,000

- Training. Activities consist of workshops and field instruction to produce personnel well-trained in implementing prevention program procedures. Subjects to be covered include plant identification, survey of commercial outlets that could be selling milfoil, documentation of survey activities, field orientation, treatment methods, and reporting procedures. 5,000

- Monitoring and Evaluation. Monitoring consists of persistence and drift tests, root kill analysis, and selectivity of plant kill by transect analysis at selected treatment sites. Evaluation consists of cost and effectiveness analysis of the overall program, including state-of-the-art review. 7,000

- Reporting. Compilation of the separate elements of the prevention program will be accomplished with discussion on methods for improving the overall effectiveness. This information will provide input to the annual design memorandum supplement. 4,000

• Supervision and Administration. This includes Department of Ecology ($22,000)1/ and Corps of Engineers ($32,000)2/ administration and management costs for the prevention program. $54,000

TOTAL	$200,000

4. Control Program. The areas designated for treatment in the 1980 control program in western Washington total approximately 100 acres. The actual cost of the 1980 control program will be dependent upon the combination of treatment methods employed. The highest cost involves the use of a mechanical harvester in all areas except beaches, where fiberglass bottom screens would be used. The lowest cost program involves the use of 2,4-D (BEE) in all areas. The highest and lowest costs are:

Low-Cost

2,4-D (BEE granular) 100 acres	$ 8,500
Labor and Equipment	5,500
Contingencies	3,500
Monitoring and Evaluation	33,000
Local Administration	2,000
WDE Supervision	15,500
Corps Management	8,000
TOTAL	$76,000

High-Cost

Mechanical Harvesting 90 Acres @ $530/Acre3/	$ 47,700
Fiberglass Bottom Screens 10 acres @ $9,000/Acre4/	90,000
Contingencies	13,800
Monitoring and Evaluation	3,000
Local Administration	4,000
WDE Supervision	25,500
Corps Management	8,000
TOTAL	$192,000

1/Based on 60 percent of 1 man-year plus travel.
2/Based on 80 percent of 1 man-year plus travel, including annual design memorandum supplement.
3/Includes labor, equipment rental, and disposal of harvested milfoil.
4/Includes purchase and installation.

5. Annual Aquatic Plant Management Program Costs. The estimated costs for the Aquatic Plant Management Program are tabulated below:

	Low Cost	High Cost
Prevention Program	$200,000	$200,000
Control Program	76,000	192,000
TOTAL	$276,000	$392,000
Federal Share	$193,000	$274,000
Non-Federal Share	$83,000	$118,000

appendix b

BENEFIT ANALYSIS

APPENDIX B

DETAILED BENEFIT ANALYSIS

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TABLES

FIGURES

1. General. Benefits creditable to the Aquatic Plant Management Program in Washington State are derived from consideration of the loss of water-related recreation opportunities, and from the fact that private property owners are willing to assume the cost of eliminating milfoil obstructions to recreation. Benefits have been evaluated separately for the control and prevention programs.

2. Control Program. Economic justification for the control program is based on preventing recreation loss (swimming and beach activity) and on the public's willingness to pay for elimination of milfoil hazards. Total economic benefits are estimated at $625,000 in 1980, the first year of the control program. Each year thereafter, as the scope of the control program is modified, attributable benefits will be redetermined.

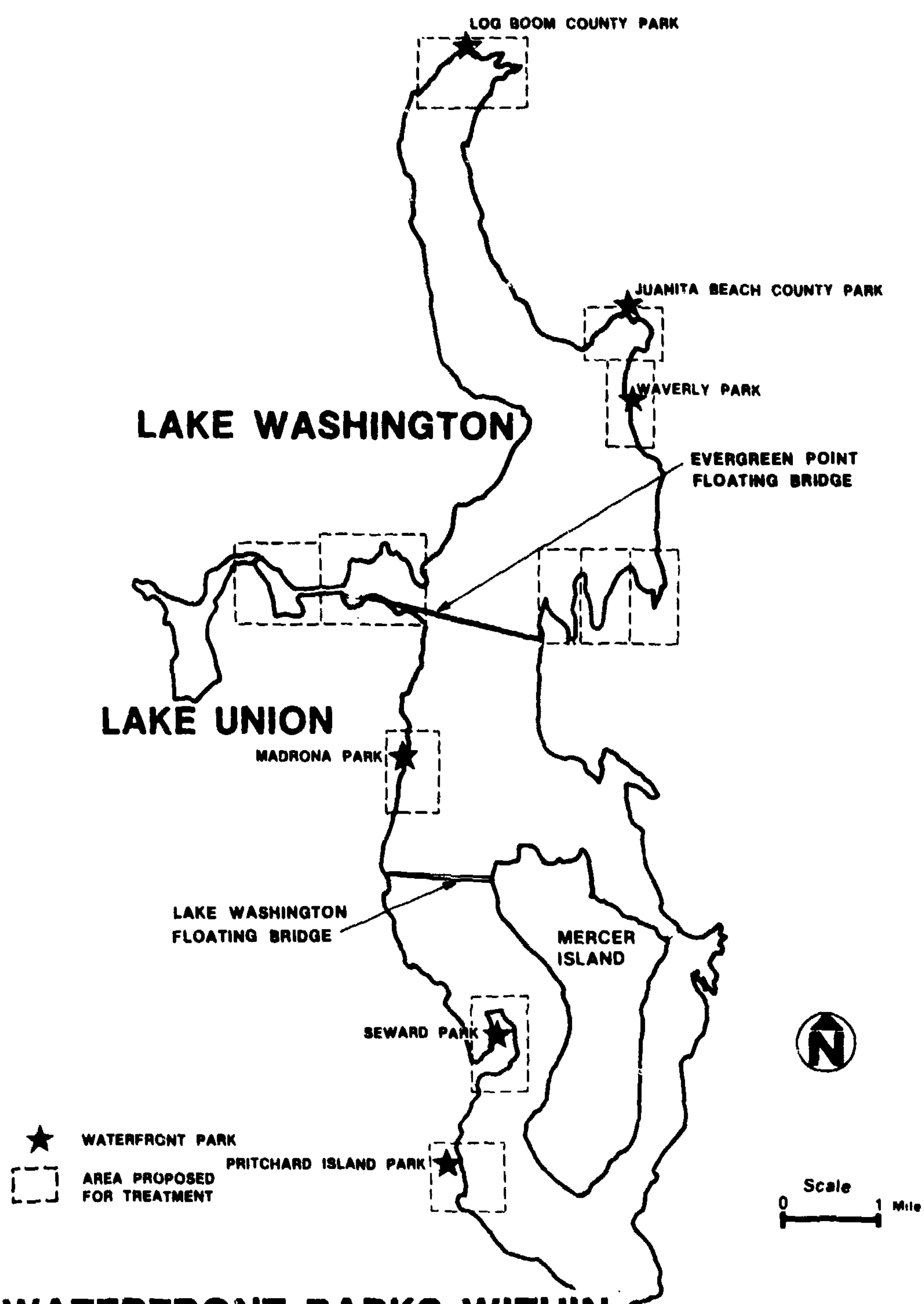
3. Economic benefits accrue from swimming and beach activity which, without a control program, would be lost annually because of encroachment of milfoil. A precedent for swimming beach closure due to milfoil encroachment was established when the swimming beach at Steamboat Rock State Park in eastern Washington was closed by the Washington State Parks Commission in 1978.

4. It cannot be accurately predicted that swimming beaches will be uniformly or simultaneously impacted by milfoil encroachment. Therefore, a 50 percent loss in swimming participation has been estimated. The economic analysis is based on the assumption that all swimming beaches will be impacted by milfoil growth, but that none will be closed to public use by park officials. Because encroaching milfoil reduces open-water areas suitable for swimming, a very real deterrent to swimming at control program beaches will be present. The Washington State Parks Commission and other responsible agencies are expected to place certain restrictions on swimming, including the posting of signs warning of the presence of milfoil.

5. In addition, a 35 percent loss in beach activity participation, which includes sunbathing, playing games, picnicking, sightseeing, and other leisure activities, is claimed. A similar level of reduction in beach activity participation was noted at Steamboat Rock State Park in 1978 following closure of the swimming beach due to milfoil infestation.1/

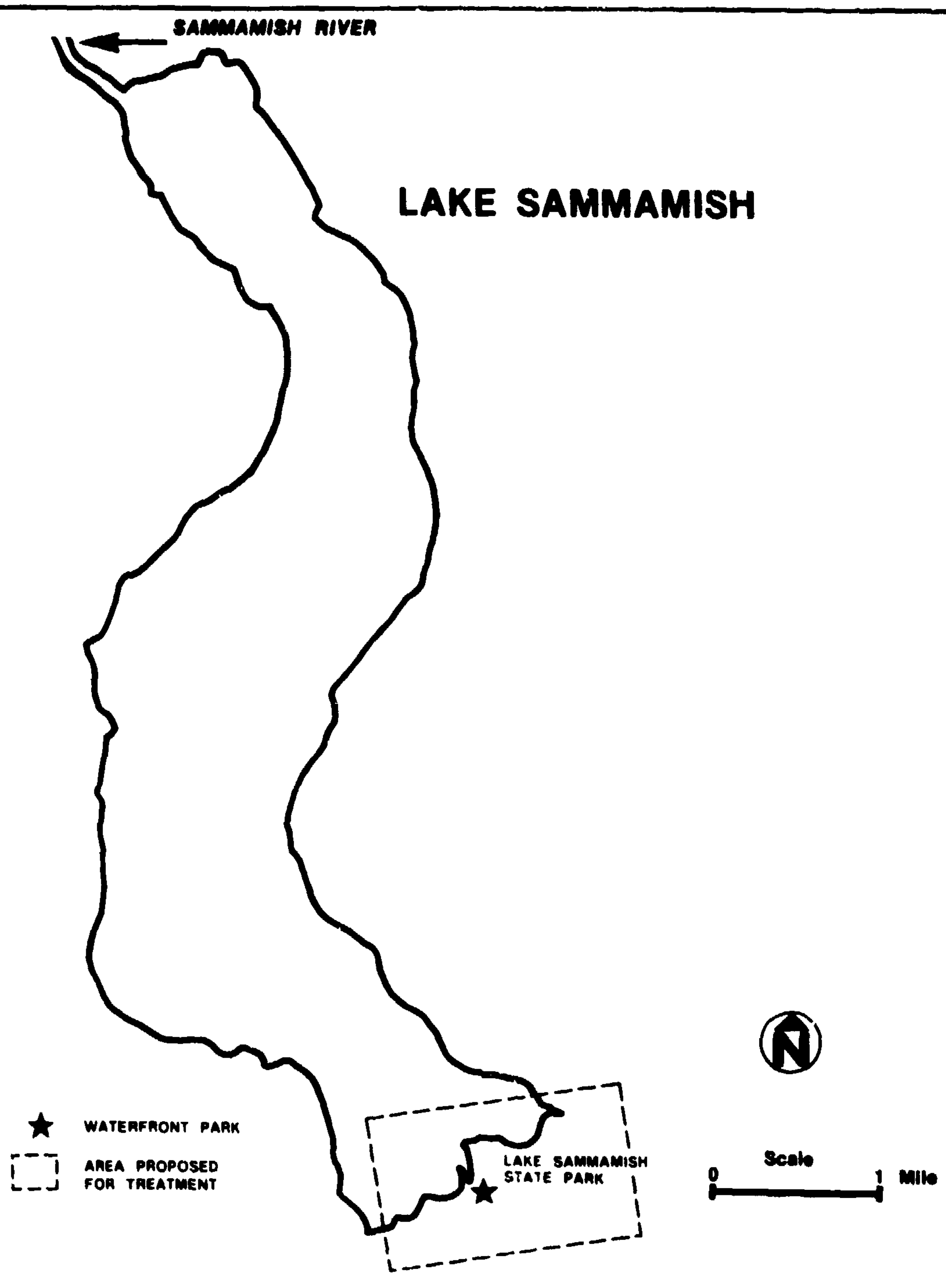
6. Seven waterfront parks within the Lake Washington-Lake Sammamish system have been identified as having milfoil infestations and are included in areas of the proposed 1980 control program (see figures B-1 and B-2). Swimming and beach activities at these parks during

1/Telecommunication on 17 April 1979 with Mr. Gary Herron, Park Manager, Steamboat Rock State Park, Electric City, Washington.



WATERFRONT PARKS WITHIN PROPOSED TREATMENT AREAS, LAKE WASHINGTON, 1980

FIGURE B-1



WATERFRONT PARKS WITHIN PROPOSED TREATMENT AREA LAKE SAMMAMISH, 1980

FIGURE B-2

the summer of 1978 is tabulated in table B-1. To calculate the economic benefits that would accrue from the control program, the summer swimming and beach activity, measured in recreation activity,1/ has been projected to 1980 levels2/ with and without a control program (see table B-2).

TABLE B-1
CONTROL PROGRAM AREAS
SUMMER SWIMMING AND BEACH ACTIVITY
(JUNE, JULY, AND AUGUST) - 1978

	Recreation Activity	
Waterfront Park	Swimming	Beach Activity
Madrona Park	8,296	10,695
Seward Park	5,465	6,984
Pritchard Island Park	4,201	7,113
Waverly Park	5,942	8,913
Juanita Beach County Park	23,878	26,201
Logboom County Park	3,878	11,829
Lake Sammamish State Park	256,680	293,577
TOTAL ACTIVITIES	308,340	365,312

SOURCE: Park and recreation departments of the city of Seattle, King County, and the State of Washington.

TABLE B-2
CONTROL PROGRAM AREAS
PROJECTED SUMMER SWIMMING AND BEACH ACTIVITY - 1980

	Recreation Activity	
With Control Program	Swimming	Beach Activity
Total Control Program Area	320,308	379,491
Without Control Program		
Total Control Program Area	160,154	246,669
RECREATION LOSS	160,154	132,822

1/A "recreation activity" is a measure of recreation use consisting of a visit by one individual to a recreation site, area, or project for recreation purposes during all or any portion of a 24-hour day. May consist of several activity days.

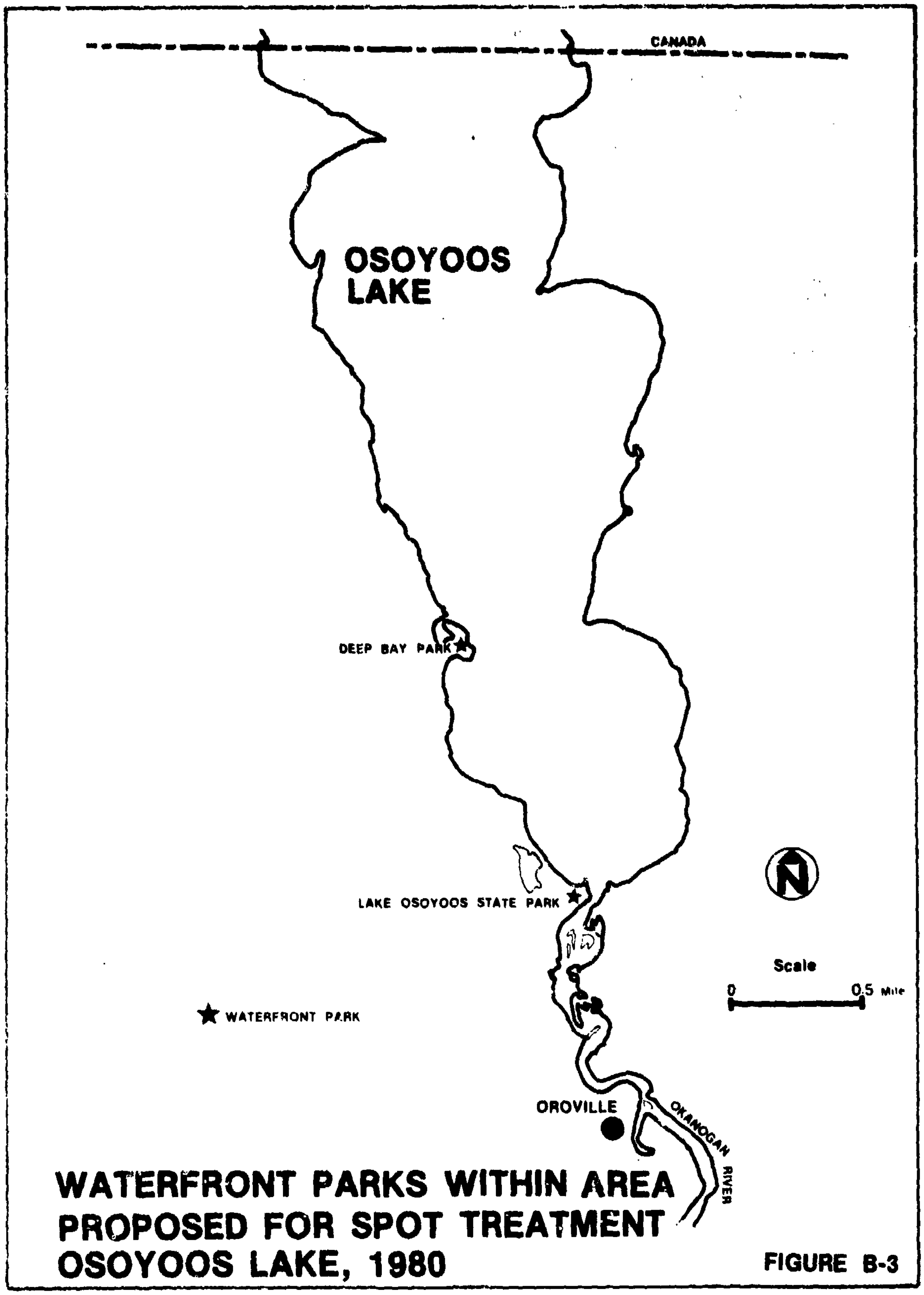
2/Based on the projected rate of increase of swimming activity occasions in King County calculated by the Washington State Interagency Committee for Outdoor Recreation.

7. To convert recreation loss to economic benefits, a recreation value of $2 per activity was assigned. This value, which falls within the guidelines provided by the Water Resources Council's Principles and Standards for Planning Water and Related Land Resources, dated 10 September 1973, reflects both the quality of the swimming and beach activity opportunities and the degree to which comparable opportunities are available. The quality of recreational opportunities in the proposed treatment areas is high due to the proximity of the water bodies to the Seattle metropolitan area and to other recreational and cultural opportunities. Water quality is also very good, and water temperatures are warmer than in nearby saltwater Puget Sound. While numerous alternatives to the seven waterfront parks included in the proposed 1980 control program are available at other swimming beaches in the system, loss of recreational opportunity at these seven due to milfoil infestation would likely be accompanied by a similar loss at neighboring beaches as well. Boating benefits are derived from the "willingness to pay" concept and are based upon the willingness of waterfront property owners to assume the expense of treating milfoil in the public waters adjacent to their property. The value of the benefits are obtained by the cost of the treatment method that property owners would be willing to pay in the absence of any other program. Benefits are based on the treatment of 50 acres of public waters not adjacent to public parks on Lake Washington. Benefits range from $39,000 to $80,000 depending on whether low-cost (Chemical 2,4-D BEE) methods or high-cost (mechanical harvester) methods are considered. For the purpose of this analysis, the more conservative, lower value of $39,000 was used. In the absence of a low-cost program, it is assumed that property owners would be willing to pay for the high-cost program. These higher benefits were not used. The dollar value of public recreation benefits are as follows:

TABLE B-3
PUBLIC RECREATION BENEFITS
CONTROL PROGRAM

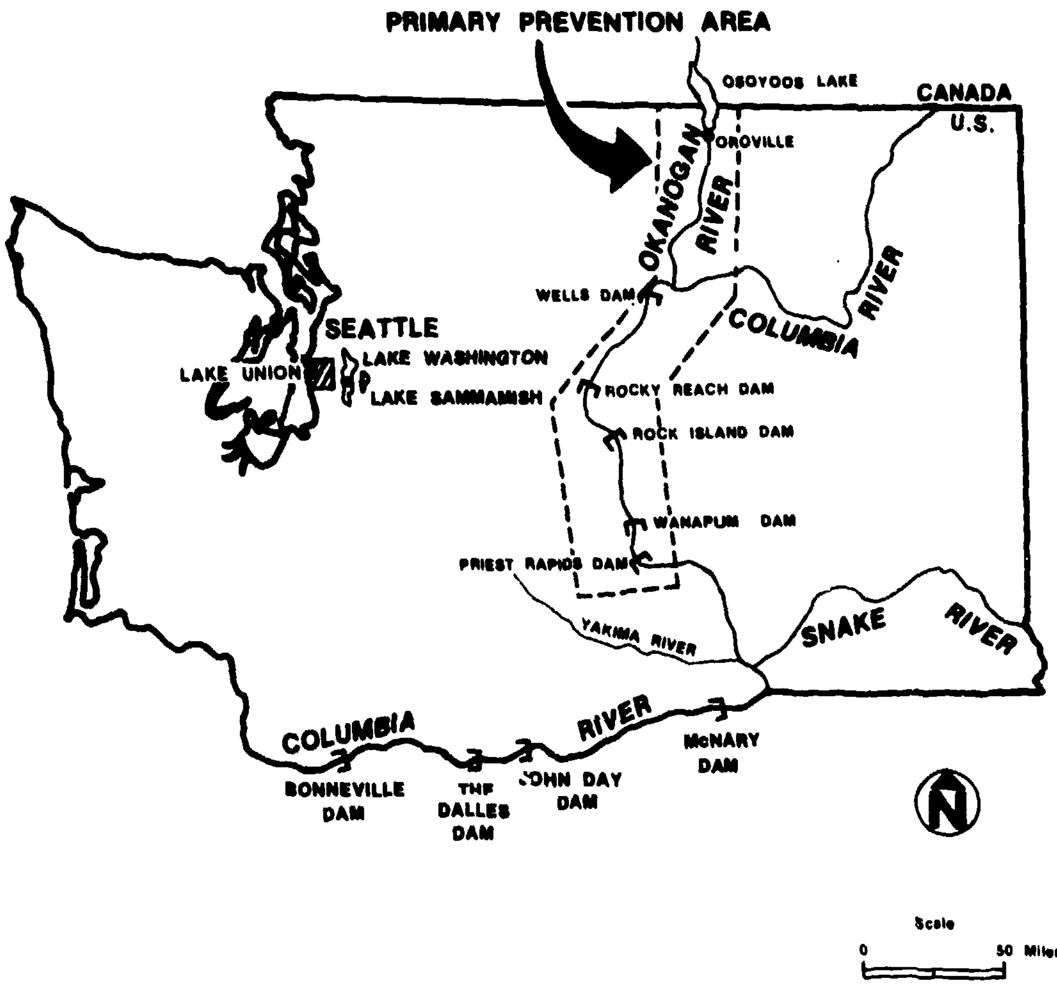
	Recreation Loss		Unit Day Value		Economic Benefits
Swimming	160,154	x	$2	=	$320,300
Beach Activity	132,822	x	$2	=	265,600
Boating					39,000
TOTAL CONTROL BENEFITS					$624,900

8. Prevention Program. The prevention program for 1980 will encompass the United States portion of Osoyoos Lake (see figure B-3), Okanogan River, and five reaches on the Columbia River: Wells Reach, Rock Reach, Rock Island Reach, Wanapum Reach, and Priest Rapids Reach (see figure B-4).



WATERFRONT PARKS WITHIN AREA PROPOSED FOR SPOT TREATMENT OSOYOOS LAKE, 1980

FIGURE B-3



OKANOGAN - COLUMBIA RIVER PRIMARY PREVENTION AREA 1980

FIGURE B-4

9. Economic justification for the prevention program is based on the prevention of recreation loss of swimming and beach activity. No recreation benefits are claimed for swimming or beach activity within Rock Island Reach of the Columbia River because no potential for milfoil growth has been identified in this area. Also, no recreation benefits are claimed for swimming or beach activities on the Okanogan River because no public facilities are available on the river.

10. Recreation benefits are claimed for the prevention of recreation loss in the infestable portions of the Columbia River downstream of the prevention program area. This segment of the Columbia River is comprised of the following six river reaches: Hanford Reach, McNary Reach, John Day Reach, the Dalles Reach, Bonneville Reach, and Downstream of the Bonneville Reach (see figure B-4). All of these areas, with the exception of the Downstream of Bonneville Reach, are under Federal jurisdiction. Benefits have not been claimed for recreation loss in Hanford Reach, because no potential for milfoil growth has been identified in this area. Total average annual economic benefits over the 100-year period of economic analysis of the prevention program (1980 to 2080) are estimated at $772,000 (see table B-6).

11. Recreation benefits accrue from swimming and beach activity participation which, without a prevention program, would be lost annually because of encroachment of milfoil. Benefits were based on the same assumptions made for the control program in western Washington: (1) losses are claimed only for the three summer months (June, July, and August) during which beaches are officially open for swimming; (2) a 50 percent loss in swimming will occur; and (3) a 35 percent loss in beach activity participation will also occur.

12. The anticipated summer swimming and beach activity for the prevention program area for 1980 is tabulated in table B-4. This forecast represents the recreation expected at the time the prevention program begins. In table B-5, swimming and beach activity is projected to 1993 levels (estimated year of maximum infestation without prevention program) to represent future conditions both with and without the prevention program. The projection of swimming and beach activity to 1993 levels is based on projected rates of increase of swimming activity calculated by the Washington State Interagency Committee for Outdoor Recreation and the Oregon Parks and Recreation Branch, Department of Transportation.

TABLE B-4
PREVENTION PROGRAM AREAS
SUMMER SWIMMING AND BEACH ACTIVITY
BASE CONDITIONS - 1980

Water Body	Recreation Activity: Swimming	Recreation Activity: Beach Activity
Osoyoos Lake1/	17,500	21,600
Wells Reach	22,000	27,200
Rocky Reach	27,100	33,500
Wanapum Reach	49,800	61,500
Priest Rapids Reach	32,600	40,300
McNary Reach	68,000	84,000
John Day Reach	25,000	30,900
The Dalles Reach	18,000	22,200
Bonneville Reach	34,000	42,000
Downstream of Bonneville Reach	300,000	370,400
TOTAL PREVENTION PROGRAM AREA	594,000	733,600

1/Includes Osoyoos Lake State Park and Deep Bay Park (Oroville).

SOURCES: Washington State Parks and Recreation Commission, Corps of Engineers' project visitation data, and Corps of Engineers' Columbia River and Tributaries Review Study: Recreation Needs Assessment.

TABLE B-5
PREVENTION PROGRAM AREAS
SUMMER SWIMMING AND BEACH ACTIVITY
FUTURE CONDITIONS - 1993

	Recreation Activity: Swimming	Recreation Activity: Beach Activity
With Prevention Program		
Total Prevention Program Area	720,400	889,300
Without Prevention Program		
Total Prevention Program Area	360,200	578,045

13. Average annual economic benefits were determined by first calculating average annual equivalent visitation at 7-1/8 percent interest over the 100-year period of analysis (1980 to 2080), both with and without the prevention program. Average annual equivalent visitation was based on swimming and beach activity expected in 1980 (base conditions) and on these activities, with and without the prevention program, projected to 1993. Visitation was assumed to remain constant after 1993. The difference in average annual equivalent visitation, with and without the prevention program, was the value used to derive economic benefits by applying a recreation

unit day value of $1.75 per visitation day lost. This value is based on unit day values assigned to Corps of Engineers' projects upstream and downstream of the prevention program area on the Columbia River, is within Water Resources Council guidelines, and reflects both the quality and availability of swimming and beach activity opportunities. Average annual economic benefits were derived as follows:

TABLE 6
PUBLIC RECREATION BENEFITS
PREVENTION PROGRAM

	1980-2080 Average Annual Equivalent Visitation		Unit Day Value		Average Annual Economic Benefits 1/
Swimming:					
With Prevention Program	680,392				
Without Prevention Program	444,833				
Recreation Loss	235,559	x	$1.75	=	$412,000
Beach Activity:					
With Prevention Program	840,018				
Without Prevention Program	634,354				
Recreation Loss	205,664	x	$1.75	=	$360,000
TOTAL PREVENTION BENEFITS	441,223	x	$1.75	=	$772,000

14. Total Benefits. The total estimated benefits derived from the prevention and control programs are tabulated below:

Prevention Program	$772,000
Control Program	625,000
TOTAL BENEFITS	$1,397,000

1/Based on 7-1/8 percent interest.

appendix c

HERBICIDES PROPOSED FOR USE IN THE AQUATIC PLANT MANAGEMENT PROGRAM

APPENDIX C
HERBICIDES PROPOSED FOR USE IN THE AQUATIC PLANT MANAGEMENT PROGRAM

TABLE OF CONTENTS

TABLES

1. General. Four chemicals could be used in the Aquatic Plant Control Program: 2,4-D (2,4-dichlorophenoxyacetic acid), diquat (6,7-dihydrodipyrido (1,2-a: 2,1-c) pyrazinediium dibromide), casoron (2,6-dichloro-benzonitrile), and dipotassium salt of endothall (7-oxabicyclo (2.2.1) heptane-2,3-dicarboxylic acid). Two formulations of 2,4-D (dimethylamine salt (DMA) and butoxyethanol ester (BEE)) are available for use. Any large-scale application of chemical would be of 2,4-D because of its selectivity. Diquat, dichlobenil, and endothall would be used only for very small areas. For this reason, the effects of 2,4-D have been given more discussion in this appendix.

2. 2,4-D.

a. Effectiveness. 2,4-D is a phenoxy herbicide which is widely used for the selective control of broadleaf weeds. At sublethal concentrations, it acts as a growth regulator, being translocated throughout the plant. At the optimum dosage for plant control, this translocation causes killing of the root system as well as the foliage. An excessive concentration would result in immediate destruction of the foliage with very little translocation (Ashton and Crafts, 1973).

The effectiveness of 2,4-D in controlling milfoil depends on the time of treatment and density of the milfoil. The British Columbia Ministry of the Environment has documented up to 98 percent reduction of milfoil in open water when treated with 20 pounds acid equivalent per acre during its rapid growth period. They have obtained 100 percent control in an area with restricted water exchange.

In areas treated later in the year, which then had a higher plant density, the reduction went down to 52 percent (British Columbia Ministry of the Environment, undated).

2,4-D has been shown to be effective in treating milfoil infestations in quiet waters of the TVA system, with complete control reported in Piney River embayment.. It is, however, ineffective in controlling growth along the main river and in lake areas where downstream flow or turbulent water rapidly dissipate the chemical (Smith, 1971).

b. Persistence. Persistence of 2,4-D in the water column is a function of factors such as rate of treatment, extent of dilution, depth, flow, or addition of water to the system. Degradation by micro-organisms (Andus, 1964) and metabolism by plants (Crafts, 1964) are major routes of herbicidal decomposition. Temperature is an important variable affecting the rate of dissipation since it influences the rate of biological activity in a treated habitat (Brown and Mitchell, 1948). Camfield (1975) noted that in deoxygenated water, 2,4-D takes 13 times as long to degrade as it does in warm aerobic water. The faster rate of degradation corresponds with conditions promoting greater metabolic activity of plants and micro-organisms.

Under laboratory conditions, 2,4-D at a concentration of 4.79 ppm in sterile water has an average half-life of 4 days (Altom and Stritzke, 1973). It was observed by Bell (1956) that ultraviolet (U.V.) radiation causes decomposition of 2,4-D molecules (cleavage of the carboxyl group) to phenolic compounds and by ring fission to aliphatic products. In natural aquatic systems, the level of U.V. light would be much lower, and absorption of that light would be much greater than under laboratory conditions.

Several genera of bacteria are known to decompose 2,4-D. These include Aerobacter, Achromobacter, Flavobacterium, and Coxyne. Aerobic conditions were essential. Degradation was attributed to the formation of adapative enzymes. Other micro-organisms observed to degrade 2,4-D are Mycoplasma sp. and paramecia (Wedemeyer, 1966; Robeck et al., 1963; Steenson and Walter, 1956 and 1958; Rogoff and Reid, 1954; Bell, 1957).

Freshwater ponds in Florida and Georgia were treated with 2, 4, and 8 pounds of 2,4-D acid equivalent per acre. The highest level of residue recorded in the water was 0.692 ppm in a Georgia pond 3 days after treatment with 8 pounds per acre. By 28 days, all six ponds in the experiment were down to 0.005 ppm (Smith and Isom, 1967).

The herbicide 2,4-D is strongly cationic and will therefore bind with soil particles upon contact (Newbold, 1975). The relative electro-negativity of sediment particles is responsible for their ability to retain 2,4-D molecules. Clay or silt will tend to bind 2,4-D more strongly than will sandy particles.

Smith and Isom (1967) measured the residues of 2,4-D in the hydrosoil of six ponds treated with the herbicide in Florida and Georgia. The highest level of residue was 0.046 ppm in a Florida pond 3 days after treatment with 8 pounds acid equivalent per acre. Twenty-eight days after the treatment, 0.007 ppm was the highest concentration found in any of the ponds.

Way and Chancellor (1976) report that 55 days after treatment with 1.33 ppm of granular 2,4-D BEE, there was a concentration of 0.1 ppm in the hydrosoil. Newbold (1976) found the persistence of liquid 2,4-D DMA in aquatic mud to be about 1 month.

The only data on the persistence of 2,4-D in the northwest waters is from British Columbia. In open-water areas, treated with 20 to 40 pounds acid equivalent per acre, detectable levels of 2,4-D were present in the water from 6 to 10 days. In a closed system, 2,4-D was detectable for 59 days. 2,4-D was detectable in the sediment from 37 to 161 days following treatment (see table C-1).

TABLE C-1

Summary of 2,4-D Concentrations (ppm) in Water Sampled from Treatment Areas (British Columbia)*

Application Site	Maximum Surface 2,4-D Concentrations	Maximum Bottom 2,4-D Concentrations	Persistence of Detectable 2,4-D (days)	Total Samples Taken
Open Sites:				
Skaha Lake	0.063	0.14	6	97
Nashwhito Creek	0.19	0.23	9	153
North Arm 20 lb/acre Retreatment	0.056	0.36	10	68
North Arm 30 lb/acre Treatment	0.060	3.25	6	68
North Arm 20 & 40 lb/acre Treatment	ND*	0.67	6	74
Enclosed Site:				
Westside Cays	1.26	4.0	59	198
			TOTAL	658

*From British Columbia Ministry of the Environment Information Bulletin (undated).

c. Breakdown Products. 2,4-D applied for aquatic plant control is broken down by ultraviolet light, algae, bacteria, and higher plants. Valentine and Bingham (1974) found the major metabolites of 2,4-D broken down by algae to be (3-hydroxy-2,4-dichlorophenoxy) acetic acid and 5-hydroxy-2,4-dichlorophenoxy) acetic acid. Crosby and Tutass (1966) found that the major reaction of 2,4-D exposed to water and ultraviolet light was the cleavage of the ether bond to produce 2,4-dichlorophenol. The 2,4-dichlorophenol is then dehalogenated to 4-chlorocatechol and presumably to 1,2,4-benzenetriol, with the final result being polymeric humic acids. The photodecomposition rate of 2,4-D sodium salt in aqueous solution was 50 percent in 50 minutes at pH 7.0. The photodecomposition rate of 2,4-dichlorophenol was much faster, 50 percent in 5 minutes at pH 7.0.

The main product of 2,4-D degradation by micro-organisms is also 2,4-dichlorophenol (Rogoff 1961), but when broken down by higher plants, several different para-hydroxylated breakdown products result (Ashton and Crafts, 1973).

Concern has been expressed that 2,4-dichlorophenol could be a carcinogen. Boutwell and Bosch (1959), in an experiment with laboratory mice, tested derivatives of phenol including 2,4-dichlorophenol for the ability to promote tumors. They showed an increased occurrence of tumors when applied in conjunction with dimethylbenzanthracene and benzene. Although they did not discuss 2,4-dichlorophenol specifically, they concluded that the hazard of phenolic compounds to man must be considered. They qualified their findings by adding that even though chronic phenol poisoning resulting from industrial contact has been observed, no association between exposure to phenol and the incidence of human cancer has been seen. They further state that the results with mice suggest that even in susceptible animals, tumors result only after continued exposure to relatively large quantities of the reagent.

A Russian study (Konstantinova et al., 1976) suggests that 2,4-dichlorophenol and 2,4-D may act synergistically to increase embryotropic effects in rats (see discussion below on teratogenicity).

d. Biological Accumulation. 2,4-D is absorbed and accumulated within the bodies of some living organisms. It is not, however, magnified in the food web. At sublethal concentrations, 2,4-D is metabolized in plants. At lethal concentrations, the excess is retained until death and decay of the plant when it is rereleased. Among aquatic fauna, some species concentrate higher amounts of 2,4-D than others, but the herbicide is not retained indefinitely. The Watt's Bar and Guntersville experiments by the TVA showed that little 2,4-D is retained by fish. Molluscs do concentrate substantial amounts of the herbicide. After treatment with 40 and 100 pounds of 2,4-D BEE per acre, mussels (*Mytilus* sp.) showed concentrations of 0.38 ppm and 0.70 ppm in 96 hours. The concentration in the water was 0.001 ppm 2,4-D after 1 hour. No ill effects were associated with the accumulation. Some mussels examined showed lower values than control organisms. Eight samples of fish were taken from

several species (channel catfish, sanger and gizzard shad), all of which retained no 2,4-D. Only one sample of bluegill had concentrated 2,4-D. Fifty days after treatment, it contained .15 ppm 2,4-D BEE (Smith and Isom, 1967). Eastern oyster was found to concentrate 2,4-D BEE at 18 ppm from water with a concentration of 0.1 ppm. A sample of these oysters was placed in clean water for 7 days, and the 2,4-D disappeared from their bodies. Wojtalik et al., (1971) examined plankton and found them to contain 3.6 ppm 2,4-D 4 weeks after treatment at 40 pounds per acre with 2,4-D DMA. Whitney (1970) measured residues of 2,4-D in benthic organisms (grass shrimp, damselfly nymphs, and scud) and found the highest concentrations to be 0.23 ppm 24 hours after treatment. Residues in blue crabs never exceeded 0.1 ppm.

e. Toxicity. The toxicity of 2,4-D is dependent upon the formulation involved and the species affected (see tables C-2 and C-3). 2,4-D is not considered to be greatly toxic to man. It is extremely unlikely that toxic doses could be received from spray applications, but safe handling and storage of the concentrate should be exercised. Berwick (1970) places the LD_{50} of 2,4-D to humans at approximately 400 mg/kg body weight. Four cases of 2,4-D poisoning recorded in the literature were discussed. Symptoms of the different victims included fatigue, nausea, vomiting, loss of weight, diarrhea, numbness of the fingers and toes, shooting pains in the feet, swelling of feet and legs, headaches, and vertigo. All of the victims did not experience all of these symptoms, and it is not known which symptoms were caused by the various chemicals mixed with the 2,4-D such as S-ethyldepropylthiolcarbonate, epichlorohydrin, kerosene, and emulsifiers.

These exposures were related to terrestrial application and were the result of misuse or accidental contact with the herbicide, prolonged contact of the herbicide on the clothes or skin, or the accidental drinking of the herbicide. Since 2,4-D is widely used in agriculture and there is a general lack of reported problems, it is assumed that it is nontoxic to humans at the levels of normal exposure. The exposure to the general public from an aquatic plant program would be minute in comparison to the exposure of agricultural workers.

The established acceptable intake of 2,4-D for humans ranges between zero and 0.3 mg/kg body weight (W.H.O., 1977). The U.S. Occupational Safety and Health standard for employees exposed to 2,4-D must not exceed an 8-hour time-weighted average of 10 mg/m^3 in a working atmosphere during an 8-hour shift for a 40-hour work week. The acceptable ceiling in U.S.S.R. is 1 mg/m^3 (Winell, 1975).

Waterfowl have a high resistance to 2,4-D. The LD_{50} for young mallards was measured to be above 1,000 mg/kg b.w. for 2,4-D acid and more than 2,025 mg/kg for the sodium salt. For young pheasants, the LD_{50} was 472 mg/kg; young coturnix, 668 mg/kg; and pigeons, 668 mg/kg. This was when the stated dosage was given orally in a capsule. The LC_{50} of diet was found to be over 5,000 ppm for the

TABLE C-2

Acute Toxicity of Herbicides to Mammals and Birds

Herbicide	Organism	LD_{50} 1/			Reference
2,4-D Acid	Mice	375	mg/kg	b.w.2/	Hill & Carlisle, 1947
"	"	368	"	"	Rowe & Hymes, 1954
"	Rats	375	"	"	Spector, 1955
"	"	666	"	"	Hill & Carlisle, 1947
"	Guinea Pigs	469	"	"	Rowe & Hymes, 1954
"	"	1,000	"	"	Hill & Carlisle, 1947
"	Dogs	100	"	"	Drill & Heratyka, 1953
"	Rabbits	800	"	"	Spector, 1955
"	Mule Deer	400-800	"	"	Tucker & Crabtree, 1970
"	Humans	About 400	"	"	Berwick, 1970
"	Chicks	541	"	"	Rowe & Hymes, 1954
"	Mallards	1,000	"	"	Pimental, 1971
"	Pheasants	472	"	"	" "
"	Coturnix	668	"	"	" "
"	Pigeons	668	"	"	" "
"	Bobwhite	5,000	"	"	" "

1/ LD_{50} - lethal dose to 50 percent of test animals.

2/Mg/kg b.w. = milligrams of the herbicide per kilogram of body weight of the organism.

TABLE C-2 (con.)

Acute Toxicity of Herbicides to Mammals and Birds

Herbicide	Organism	LD_{50} 1/	Reference
Dichlobenil	Rats	3,160 mg/kg/bw	USDI, 1970
"	Mallards	2,000 " "	Tucker & Crabtree, 1970
"	Pheasants	1,189 " "	Tucker & Crabtree, 1970
Diquat	Rat	400-440 " "	WSA, 1967
"	Mallard	564 " "	Tucker & Crabtree, 1970
Endothall (Dipotassium salt)	Rat	125 " "	Amchem, undated

TABLE C-3

Acute Toxicity of Herbicides to Fish

Herbicide	Common Name of Fish	Species	Time Exp.	LC_{50} 1/	Reference
2,4-D (BEE)	Bluegill	*Lepomis macrochirus*	24 hrs.	2.1 ppm	Hughes & Davis, 1963
"	"	"	48 hrs.	"	"
2,4-D (DMA)	"	"	24 hrs.	220-548	"
"	"	"	48 hrs.	220-458	"
"	Channel Catfish	*Ictalurus punctatus*	96 hrs.	125 ppm	U.S.A.C.O.E., 1978
"	Fathead Minnows	*Pimephales promelas*	96 hrs.	335 ppm	"
"	"	"	48 hrs.	350 ppm	"
"	Rainbow Trout	*Salmo gairdneri*	96 hrs.	100 ppm	Folmar, 1976
Dichlobenil (Granular)	Bluegill	*Lepomis macrochirus*	24 hrs.	20.0 ppm	Jones, 1964
"	"	"	24 hrs.	37.0 ppm	Hughes & Davis, 1962
"	"	"	48 hrs.	20.0 ppm	Bohmont, 1967
"	Rainbow Trout	*Salmo gairdneri*	48 hrs.	22.0 ppm	Jones, 1964
"	Harlequin Fish		24 hrs.	120.0 ppm	Alabaster, 1969
"	Redear	*Lepomis microlophus*	48 hrs.	20.0 ppm	Cope, 1965

1/ LC_{50} - lethal concentration to 50 percent of the test animals.

TABLE C-3 (con)

Acute Toxicity of Herbicides to Fish

Herbicide	Common Name of Fish	Species	Time Exp.	LC_{50} 1/	Reference
Dichlobenil (Wetable powder)	Bluegill	*Lepomis macrochirus*	24 hrs.	17.0 ppm	Hughes & Davis, 1962
"	"	"	24 hrs.	22 ppm	Cope, 1965
"	Rainbow Trout	*Salmo gairdneri*	24 hrs.	23 ppm	"
Diquat	Harlequin Fish		24 hrs.	76 ppm	Alabaster, 1969
"	Rainbow Trout	*Salmo gairdneri*	24 hrs.	90 ppm	"
"	Brown Trout	*S. trutta*	24 hrs.	32.6 ppm	Simonin & Skea, 1977
"	Brown Trout	"	96 hrs.	20.4 ppm	"
"	Largemouth Bass	*Micropterus salmoides*	24 hrs.	24 ppm	Surber & Pickering, 1962
"	Bluegill	*Lepomis macrochirus*	24 hrs.	91 pm	"
"	Fathead Minnow	*Pimephales promelas*	24 hrs.	140 ppm	"
"	Striped Bass	*Morone saratilis*	24 hrs.	315 ppm	Wellborn, 1969
"	Rainbow Trout	*Salmo gairdneri*	48 hrs.	12.3 ppm	FWPCA, 1968
"	Chinook Salmon	*Oncorhynchus tshauytscha*	48 hrs.	28.5 ppm	Bond, Lewis & Fryer, 1959
"	"	"	48 hrs.	28.5 ppm	Bohmont, 1967
"	Coho Salmon	*O. kisutch*	96 hrs.	30 ppm	Lorz *et al.*, 1978

1/LC_{50} - lethal concentration to 50 percent of the test animals.

TABLE C-3 (con)

Acute Toxicity of Herbicides to Fish

Herbicide	Common Name of Fish	Species	Time Exp.	LC_{50} 1/	Reference
Endothall (Acid)	Bluegill	*Lepomis macrochirus*	24 hrs.	428 ppm	Hughes & Davis, 1963
"	"	"	24 hrs.	450 ppm	Surber & Pickering, 1962
"	Fathead Minnow	*Pimephales promelas*	24 hrs.	560 ppm	"
"	Largemouth Bass	*Micropterus salmoides*	24 hrs.	560 ppm	"
"	Harlequin Fish		24 hrs.	565 ppm	Alabaster, 1969
"	Redfin Shiner	*Notropis umbratilis*	96 hrs.	95 ppm	Walker, 1963
"	Redsided Shiner	*Richardsonius balteatus*	96 hrs.	105 ppm	"
"	Bluntnose Minnow	*Pimephales notatus*	96 hrs.	120 ppm	"
"	Largemouth Bass	*Micropterus salmoides*	96 hrs.	120 ppm	"
"	Redear Sunfish	*Lepomis microlophus*	96 hrs.	125 ppm	"
"	Carp	*Cyprinus carpio*	96 hrs.	175 ppm	"
"	Yellow Bullhead	*Ictalurus matalis*	96 hrs.	175 ppm	"
"	Black Bullhead	*I. melas*	96 hrs.	180 ppm	"

1/LC_{50} - lethal concentration to 50 percent of the test animals.

TABLE C-3 (con.)

Acute Toxicity of Herbicides to Fish

Herbicide	Common Name of Fish	Species	Time Exp.	LC_{50} 1/	Reference
Endothall (Copper)	Rainbow Trout	*Salmo gairdneri*	48 hrs.	.29 ppm	FWPCA, 1968
Endothall (DMA)	"	"	48 hrs.	1.15 ppm	"
Endothall (Disodium Salt)	Redfin Shiner	*Notropis umbratilis*	96 hrs.	105 ppm	Walker, 1963 & 1964
"	Bluntnose Minnow	*Pimephales notatus*	96 hrs.	110-120 ppm	Walker, 1963 & 1964
"	Carp	*Cyrinus carpio*	96 hrs.	145-210	"
"	Brown Bullhead	*Ictalurus nebulosus*	96 hrs.	170-175	"
"	Black Bullhead	*I. melas*	96 hrs.	180-185	"
"	Bluegill	*Lepomis macrochirus*	96 hrs.	125-150	"
"	Redear Sunfish	*Lepomis microlophus*	96 hrs.	125 ppm	"
"	Largemouth Bass	*Micropterus salmoides*	96 hrs.	120-125	"

1/ LC_{50} - lethal concentration to 50 percent of the test animals.

following 2-week-old birds fed on treated feed 5 days and untreated for 3 days: mallards, pheasants, bobwhites, and coturni (Pimentel, 1971).

As with birds, mammals are at a lower risk from 2,4-D applied to an aquatic system than organisms which are restricted to that system. The LD_{50} of 2,4-D for mammals is 100 ppm and up. In long-term feeding rials, test animals were tolerant of doses up to 25 percent and as low as 0.4 percent of the acute oral LD_{50} fed on a continuing basis without ill effects. The following LD_{50} were found for several species of mammals (Pimentel, 1971):

Rats	666 mg/kg
Mice	375 mg/kg
Rabbits	800 mg/kg
Dogs	100 mg/kg
Guinea pigs	1,000 mg/kg
Mule Deer	400-800 mg/kg

These dosages represent oral intake of the specified ratio of 2,4-D to body weight. Signs of poisoning include loss of appetite, loss of weight, weakness, lack of coordination, and alterations of the liver and other internal organs.

Results of studies with fish show the acute toxicity of 2,4-D to range between 1 ppm and 1,000 ppm. Toxicity is largely associated with the esters and oil-soluble amine formulations. The water-soluble amine salts "to all intents, are nontoxic to fish" (C.A.S.T., 1975).

During the TVA's experiments at Watt's Bar and Guntersville monitoring stations, fish were observed to move out of the treated areas as a result of applying 40 and 100 pounds of 2,4-D BEE per acre. No mortality of free-swimming fish in treated areas of the lakes were observed. However, at Watt's Bar, there was a 5 percent mortality rate among caged fish (Smith and Isom, 1967). Alabaster (1969) reported that the LD_{50} for rainbow trout was 250 ppm for 24 hours. In laboratory experiments, 2,4-D acid was not toxic to bluegill or largemouth bass at 1 ppm and was only slightly toxic at 100 ppm. Bluegill, green sunfish, and smallmouth bass fry survived a concentration of 10 ppm 2,4-D BEE for 8, 4, and 5 days, respectively, during an 8-day experiment (Pimentel, 1971). No mortality was observed in native fish in an east coast estuary when 2,4-D BEE was applied at 30 pounds per acre (Beaven et al., 1962). Rawls (1965) later observed that 2,4-D acetamide applied to an estuary at 20 pounds per acre killed all caged fish (mostly pumpkinseed) within 30 days. The mortality of bluegill ranged from 19 percent to 100 percent in ponds treated with 10 ppm 2,4-D. Spawning was delayed 2 weeks. Fry production appeared essentially the same at 0.1, 0.5, 1, 5, and 10 ppm 2,4-D. Fish in the pond treated at 10 ppm showed three times the growth in weight as control fish. Other concentrations showed a greater increase in weight than did the controls but not as much as the fish in the 10 ppm concentration. The most severe

pathologic effects observed in fish at the highest concentration involved the liver, vascular system, and brain, and lasted 84 days (Cope et al., 1970).

The toxicity of 2,4-D to salmonids is not known, but early indications are that they may be more susceptible than other species (Meehan et al., 1974). Until the effects of the specific formulations of 2,4-D proposed for use are known for the species of salmonids present in the treatment areas, time restrictions will be necessary to minimize or prevent exposure.

Whitney et al. (1973) monitored the effect of a 2,4-D treatment in Currituck Sound, North Carolina. They found no acute adverse effects to fish and macroinvertebrate population. Maximum accumulation of 2,4-D in fish was 0.24 ppm, in invertebrates it was 0.23 ppm.

In 1966, the Tennessee Valley Authority (TVA) applied 888 tons of 20 percent 2,4-D (BEE) granular to 8,000 acres of milfoil in seven reservoirs at rates from 40 to 100 pound acid equivalent per acre. Extensive monitoring was done on water quality and aquatic fauna before and after the applications. No measurable toxic effect was observed on benthic fauna, including burrowing mayflies (Hexagenia), which are a principal component. Invertebrates inhabiting milfoil disappeared as their habitat was destroyed, but the overall evaluation of collected data indicated that the 2,4-D had not produced adverse effects on aquatic fauna or water quality (Smith and Isom, 1967).

The EPA (1976) states that 2,4-D is not highly toxic, but suggests that the concentration should not be allowed to exceed 10 ppm in estuarine waters. Studies by Valentine and Bingham (1974) and Hauxby (1977) indicate that relatively high concentrations of 2,4-D are required to inhibit growth of the several species of algae tested.

f. Carcinogenicity. The scientific literature concerning the carcinogenicity of 2,4-D is not conclusive. Hansen et al., (1971) fed rats varying concentrations of 2,4-D in their food for 2 years. No increase in tumors was noted until the concentration reached 1,250 mg/kg. The author stated that the raw data supported the pathological interpretation that a carcinogenic effect had not been shown.

Innes et al., (1969) conducted a large-scale study designed to screen selected pesticides for tumorigenicity in mice. They concluded that 2,4-D did not cause a significant increase in tumors after oral administration of up to 100 mg/kg for approximately 18 months.

Reuber (1979) reevaluated the test data and histological sections of the Hansen et al. (1971) study and the Innes et al. (1969) study. Rueber stated that Hansen's work indicated an increase in the incidence of malignant neoplasms with lymphosarcomas increased for both sexes and neoplasms of the mammary glands increased for female rats.

He also stated that Innes' data indicated no increase in tumors for mice fed 2,4-D in their food, but an increased incidence of neoplasms of the lung in male mice fed 2,4-D isopropyl ester, an increased incidence of reticulum cell sarcoma in female mice fed 2,4-D butyl ester, a slight increase in neoplasms of the liver in male mice and of the lung in female mice fed 2,4-D isooctyl ester, and an increase in reticulum cell sarcomas in male and female mice injected with 2,4-D isooctyl ester.

In a Russian study, Archipov and Kozlova (1974), tested the effects of the amine salt of 2,4-D fed to rats and mice for 2 years and 3 months. They concluded that their studies have shown an absence of demonstrated carcinogenicity of the amine salt of 2,4-D. In another test, they applied the amine salt of 2,4-D to the skin of mice in conjunction with 3-methylcholanthrene and benzene for a period of 20 months. These test mice showed an increase in the number of papillomas (benign tumors). The authors concluded that 2,4-D can act as a cocarcinogen which should be taken into account before recommending further use in agriculture.

g. Teratogenicity and Fetotoxicity. Schwetz et al. (1971) fed pregnant rats up to 87.5 mg/kg/day of propylene glycol butyl ether ester and isooctyl ester of 2,4-D on days 6 through 15 of gestation and tested the pups for teratogenic, embryotoxic, and fetotoxic effects. The authors stated that the only anomalies which could be related to treatment with 2,4-D were decreases in fetal body weight, subcutaneous edema, delayed ossification of bone, lumbar ribs, and wavy ribs. None of these anomalies interfered with either fetal or neonatal development or survival. The development and survival of pups for 21 days following birth was not affected by 2,4-D treatment and, therefore, the authors concluded that the anomalies were neither persistent nor detrimental. The authors also concluded that the dose level essentially without effect is 25 mg/kg/day.

Courtney (1977) working with mice, concluded that in general, the esters of 2,4-D significantly decreased fetal weight but did not affect mortality. Cleft palates were not produced with low doses of the esters except for the PGBE ester. The n-butyl and the PGBE ester at high concentrations produced a comparable incidence of cleft palates. 2,4-D butyric acid did not affect fetal development.

Khera and McKinley (1972) studied the effects of 2,4-D on pregnant rats. They found that at the highest dose, all derivatives of 2,4-D were associated with a significantly increased teratologic incidence, and that the butyl and isooctyl esters tended to depress fetal weight. There was no indication of any adverse effect on numbers of viable fetuses and only a slight suggestion of an increase in fetal mortality with several derivatives. At the lower level of treatment (12.5 mg/kg), 2,4-D derivatives induced no apparent harmful effect. The postnatal parameters of the test animals did not reveal any significant deviation from the control population.

Konstantinova (1976), also working with pregnant rats, concluded that 2,4-D and 2,4-dichlorophenol administered separately or in combination did not kill embryos or cause other gross anatomical defects of development at any tested dose (up to 50 mg/kg 2,4-D and 1 mg/kg 2,4-dichlorophenol). The higher doses did, however, cause pathology of internal organs of fetuses in the form of hemorrhages. At lower doses (1 and 0.1 mg/kg of 2,4-D and 0.1 mg/kg 2,4-dichlorophenol), however, these hemorrhages were not produced. Combined administration of these compounds at 0.1 mg/kg each did produce an increase in hemorrhaging suggesting a synergistic effect.

h. Mutagenicity. Andersen et al. (1972) found no conclusive evidence indicating that 2,4-D is a mutagen in tests with the bacterium *Escherichia coli* and T-4 bacteriophage. (These two test organisms are known to interact in genetic recombination.) Increases in aberrations were within the range of spontaneous rates. In the yeast *Saccharomyces cervisiae* strain D-4, gene conversion was increased by concentrations of 2,4-D above 400 ppm. Mitotic recombination in *S. cervisiae* D-5 was increased by 2,4-D at 300 ppm (Siebert and Lemperle, 1974: Zetterberg et al., 1977). Johnson (1971) noted no genetic variations in men who were exposed to 20 and 40 mg of 2,4-D per day.

Magnuson et al. (1977) stated that although 2,4-D seems to be mutagenic in fruit flies, the effect is quite weak, only amounting to between two and three times the control level at an exposure of 1,000 ppm in the substrate for 2 weeks.

Ahmed et al. (1977), working with Chinese hamster V79 cells exposed to concentrations approaching the EPA tolerance limits, concluded that 2,4-D increased the number of ovabain-resistant mutants and acted as a weak mutagen.

i. Chronic Exposure. The effects of long-term exposure to low concentrations of 2,4-D are not known. The exposure received by fish and wildlife in the treatment areas would be short-term and at a low concentration because of the rapid breakdown. Benthic organisms would be subject to longer periods of exposure. The exposure could be repeated annually. The exposure to humans would be very low because of the restrictions placed on water use following treatment.

3. Endothall (dipotassium salt)

a. Effectiveness. Endothall labels indicate that milfoil (*Myriophyllum* spp.) would be controlled by concentrations of 2-3 ppm. Milfoil control has been verified in northwest waters recently in Clear Lake, 1978, and Lake Washington 1979 by A-1 Spray Service. As with other aquatic herbicides, it is very effective in quiet waters and less effective in areas with rapid water exchange.

b. Persistence. The presence of endothall in the water was monitored for the Lake Washington application in the summer of 1979. The maximum concentration detected in the water column was 1.2 ppm on

the day of application. After ten days the maximum concentration detected was 0.017 ppm. (McCall, 1979).

c. Breakdown Products. Although some plants metabolize endothall, the main decomposition appears to be performed by microorganisms. The initial breakdown occurs in the ring structure and results in a variety of seemingly nontoxic, naturally occurring carbohydrate chains and carbon dioxide (Halter, 1979).

d. Biological Accumulation. Laboratory tests with algae, snails, goldfish and brown trout, daphnia and field tests in ponds and lakes with largemouth bass, bluegills, and catfish, indicated that endothall was not accumulated and did not persist in these species for more than a few days following exposure (Pennwalt Corp. 1979, Proprietary Information, as cited by Halter, 1979).

e. Toxicity. The acute toxicity of endothall to fish species is relatively low, with the L.C. 50 for 96 hours generally being above 100 ppm (see table C-3). The toxicity to mallard ducks is so low that it can essentially be classified as non-toxic (Pennwalt Corp., 1979, Proprietary Information, as cited by Halter, 1979). The LD 50 of dipotassium endothall to rats is 125 mg/kg (see table C-2).

f. Carcinogenicity. Rats were fed 0,600, 1200, and 2400 ppm dipotassium and disodium endothall in their diets for two years. The test groups did not show any differences from the control group and it was concluded that endothall is not carcinogenic in the rat (Pennwalt Corp., 1979, Proprietary Information, as cited by Shearer, 1979).

g. Teratogenicity and Fetotoxicity. Pregnant rats were given 0.01, 0.13, and 2.0 mg/kg endothall acid on days 6 through 13 of gestation. No effects were seen on implantation, gestation, or gross fetal abnormalities in skeletal or soft tissue (Pennwalt Corp., 1979, Proprietary Information, as cited by Shearer, 1979).

h. Mutagenicity. Endothall tests were negative for inducing point mutations in bacteria Samonella typhimurium and the phage T4 (Andersen et al., 1972). Hadder (1970), however, found a mutation rate 8-1/2 times normal in fruit flies (Drosophilia melanogaster) exposed to endothall (as cited by Shearer, 1979).

4. Diquat

a. Effectiveness. Diquat is a broad spectrum contact herbicide which would kill milfoil and most native aquatic plants down to the hydrosoil. It would not affect the roots (Shealy, 1971, as cited by Halter, 1979).

b. Persistence. Diquat generally does not persist in the water column for more than 10 days. Diquat, however, is strongly cationic and adsorbs to the sediment where it has been known to persist for up to several years (Simsiman, and Chesters, 1976, as cited by Halter, 1979).

c. Breakdown Products. The known breakdown products of diquat include 1,2,3,4-tetrahydro-1-oropyrido (1,2,-a) -5-pyrazinium ion (TOPPS); pyridine-2-carboxamide (picolinamide); pyridine-2-carboxylic acid (picolinic acid); 3,4-dihydro-8-hydroxy-2H-pyrido (1,2-a) pyrazin-1,6-dione; 3,4-dihydro-2H-pyrido (1,2-a) pyrazin-1,6-dione; 6,7-dihydro-4-oxo-dipyrido (1,2-a: 2'-1'-c) pyrazine-8-ium ion (diquat monopyridone); and 6,7-dihydrodipyrido (1,2-a: 2'-,1'-c) pyrazin-4-9-dione (diquat dipyridone). The persistence or biological effects of these compounds are not documented (Chevron Chemical Co., 1979, as cited by Halter 1979).

d. Biological Accumulation. Diquat residues in bluegills in ponds treated with 1 ppm peaked at 0.5 ppm after 10 days and were undetectable after 12 weeks. (Gilderhus, 1967, as cited by Halter, 1979). Shellfish in Chesapeake Bay did not build up any concentration of Diquat even though the sediment contained high concentrations for over a year (Haven, 1969, as cited by Halter, 1979).

e. Toxicity. A review of the literature indicates that diquat produces a moderate to low acute toxicity (5 to greater than 100 ppm) to most tested aquatic invertebrates. It has shown a higher toxicity (0.05 to 3 ppm), however, to daphnia and amphipods (Halter, 1979). The toxicity to fish ranges from a $L.C._{50}$ of 12.3 ppm for 48 hours, to 315 ppm for 24 hours (see table C-3). The $L.D._{50}$ for rats is 400-440 mg/kg/bw, mallards is 564 mg/kg/bw (see table C-2).

f. Carcinogenicity. Rats fed 0, 125, 250, 500, and 1000 ppm diquat for 2 years did not cause the formation of tumors. The group fed 1000 ppm did not survive due to the toxic dose (FAO/WHO, 1971, as cited by Shearer, 1979). Another study with rats using 0, 10, 50, 100, 250, 500 and 1000 ppm, also failed to show tumor formation. Most test rats did develop cataracts (Clark and Hurst, 1970, as cited by Shearer, 1979).

g. Teratogenicity and Fetotoxicity. Several studies were done to determine the developmental toxicity of diquat but the methodology (too high of dosages or wrong timing of exposure) was inadequate to draw any conclusions (Shearer, 1979).

h. Mutagenicity. Tests for mutagenicity were negative for microbial screening systems, yeast and fruit flies, but caused an increase in unscheduled DNA synthesis in human cell cultures (Shearer, 1979).

5. Dichlobenil.

a. Effectiveness. The dichlobenil label indicates effectiveness against a wide range of aquatic and terrestrial plants. Proprietary information from the Thompson-Hayward Chemical Company (as cited by Halter, 1979) verifies that milfoil and most native aquatic species are susceptible.

b. Persistence. Five studies in warmwater ponds summarized by Halter (1979) showed that dichlobenil generally persists for 3 to 5 months in pondwater. Residues may persist for six months or longer in the sediment.

c. Breakdown Products. The most commonly identified metabolite of dichlobenil in the aquatic system is 2,6-dichlorobenzamide, which is relatively resistent to breakdown. Another, 2,6-dichlorobenzoic acid, has been shown to be less toxic than dichlobenil (Halter, 1979).

d. Biological Accumulation. Zooplankton may accumulate 5-10 ppm dichlobenil following application and then eliminate it over a two-month period. Benthic invertebrates may accumulate up to 2 ppm and eliminate it in one month. Fish can accumulate toxic doses if subject to prolonged exposure (Halter, 1979).

e. Toxicity. Laboratory tests indicate that dichlobenil has a moderate to low acute toxicity (10 to 50 ppm) for most aquatic invertebrates tested. This toxicity is not seen under field conditions, however. Laboratory tests show moderate to low acute toxicity to warm water fish species tested but higher toxicity with continued exposure (Halter, 1979). The acute toxicity to mammals is relatively low, with $L.D._{50}$'s in the range of 1000 to 3000 mg/kg/bw (see table C-2).

f. Carcinogenicity. Rats were fed 0, 20, 50, and 100 ppm dichlobenil in their diet for two years. They showed no effect on growth or mortality and produced no tumors that could be correlated to treatment or dose (Von Genderen and von Esch, 1968, as cited by Shearer 1979).

g. Teratogenicity and Fetotoxicity. Pregnant mice were given 60 mg/kg dichlobenil per day on days 3 to 14 of gestation. There was no difference in number of fetuses, litter size, or percentage of dead fetuses. No detailed examination for defects was performed (Van Genderen and von Esch, 1968, as cited by Shearer, 1979).

h. Mutagenicity. Dichlobenil was tested for its ability to induce point mutations in *Salmonella typhimurium*, the phage T and T4, three other species of bacteria, and yeast. The results were negative for all tests (Shearer, 1979).

appendix d

LETTERS OF COORDINATION

APPENDIX D
LETTERS OF COORDINATION
TABLE OF CONTENTS

JUN 16 1978

NPSEN-PL-ER

Mr. Frank Green
Washington State Historical Society
315 North Stadium Way
Tacoma, Washington 98403

Dear Mr. Green:

We are currently preparing a draft environmental impact statement on the proposed Aquatic Plant Management Program for the State of Washington. A description of the project is attached as inclosure 1.

Based on readily available information which you may wish to furnish at no cost to the U.S. Government, I would appreciate receiving information on the effect, if any, this project would have on any known or potential historical, prehistorical, and paleontological resources.

Any questions you have may be referred to Ms. Karen Mettling or Mr. Robert Rawson at (206) 764-3624. We would appreciate receiving your reply by 15 July 1978 so that your comments can be incorporated in the draft statement.

This same request is being sent to the individuals listed in inclosure 2.

Sincerely yours,

2 Incl
As stated

SAME CORRESPONDENCE SENT TO:

Mr. Frank Green
Washington State Historical Society
315 North Stadium Way
Tacoma, Washington 98403

Richard D. Daugherty, Director
Washington Archeological Research Center
Washington State University
Pullman, Washington 99163

Jeanne Welch, Deputy State Historic
Preservation Officer
Office of Archeology and Historic Preservation
111 West 21st Avenue
Olympia, Washington 98504

Jerry V. Jermann, Director
Office of Public Archeology
Institute for Environmental Studies, FM-12
University of Washington
Seattle, Washington 98195

Mr. Garland Gordon
Interagency Archeological Service
Heritage Conservation and Recreation Service
Post Office Box 36062
San Francisco, California 94102

Louis S. Wall, Assistant Director
Office of Review and Compliance
Advisory Council on Historic
Preservation
Post Office Box 25085
Denver, Colorado 80225

STATE OF WASHINGTON
Dixy Lee Ray
Governor

OFFICE OF ARCHAEOLOGY AND HISTORIC PRESERVATION
111 West Twenty-First Avenue, Olympia, Washington 98504 206/753-4011

July 5, 1978

Steven F. Dice
Chief, Environmental Resources Section
Seattle District, Corps of Engineers
PO Box C-3755
Seattle, WA 98124

Re: Aquatic Plant Management Program,
Request for Comments.

Dear Applicant:

We have reviewed the project materials forwarded to us for the above project and would like to make the following comments:

XXX *Insufficient information:* We will need a detailed narrative of the project elements; a map of the project site and surrounding area showing topography, drainage, specific project boundaries, and indicating County, Section, Township, and Range; line drawings of the project; photographs of structures to be renovated or demolished.

__ *No resources present:* No properties are listed in the National and State Register of Historic Places or the State Inventory of Historic Places which may be impacted by the project. (Properties include archaeological-historic resources).

__ *Potential effects on unknown resources:* There is reasonable probability that cultural resources exist in the project area and a cultural resources survey is recommended as part of project construction.

__ *urces present, no effect.*

__ *Resources present, effect uncertain:* see below for comment.

__ *No adverse effect on National Register property.*

__ *Ac se effect on National Register property:* see below for comment.

Sincerely,

Sheila Stump, Historic Preservation Spec.
for Jeanne M. Welch, Deputy State
Historic Preservation Officer

bp

Comments: We will need specific activities and locations to be identified before we can comment on the potential for impact to cultural resources.

Form AHP R-5 (Rev. 3/78)

30 JAN 1979

NPSEN-PL-ER

Jeanne Welch, Deputy State Historical
Preservation Officer
Office of Archeology and Historic
Preservation
111 West 21st Avenue
Olympia, Washington 98504

Dear Ms. Welch:

By letter of 15 June 1978, we notified your agency of our proposed Aquatic Plant Control Program for the State of Washington. The purpose of this followup letter is to provide you with an updated project description, attached as inclosure 1.

Based on readily available information which you may wish to furnish at no cost to the U.S. Government, I would appreciate receiving information on the effect, if any, this project would have on any known or potential historical, prehistorical, and paleontological resources.

Any questions you have may be referred to Mr. Robert Rawson, telephone (206) 764-3624. We would appreciate receiving your reply by 15 February 1979 so that your comments can be incorporated in the draft statement.

Sincerely yours,

1 Incl
As stated

SIDNEY KNUTSON, P.E.
[illegible]

NPSEN-PL-ER

15 JUN 1978

Galen S. Bridge, State Conservationist
Soil Conservation Service
United States Courthouse, Room 360
Spokane, Washington 99201

Dear Mr. Bridge:

We are currently preparing a draft environmental impact statement on the proposed Aquatic Plant Management Program for the State of Washington. A description of the project is attached as inclosure 1.

We would appreciate any information or opinion the U.S. Department of Agriculture has concerning the impact of this project on prime and unique farmlands.

Any questions you have may be referred to Ms. Karen Mettling or Mr. Robert Rawson at (206) 764-3624. We would appreciate receiving your reply by 15 July 1978 so that your comments can be incorporated in the draft statement.

Sincerely yours,

SIDNEY KNUTSON, P.E.
Asst. Chief, Engineering Division

1 Incl
As stated

United States Department of the Interior
BUREAU OF MINES
EAST 315 MONTGOMERY AVENUE
SPOKANE, WASHINGTON 99207

Western Field Operations Center
February 6, 1979

Mr. Sidney Knutson, P. E.
Asst. Chief, Engineering Division
Seattle District, Corps of Engineers
P.O. Box C-3755
Seattle, WA 98124

Dear Mr. Knutson:

We anticipate no adverse impacts on mineral development from implementation of the Aquatic Plant Control Program for the State of Washington.

Sincerely yours,

R. N. Appling, Jr., Chief
Western Field Operations Center

U.S. ENVIRONMENTAL PROTECTION AGENCY

REGION X

1200 SIXTH AVENUE

SEATTLE, WASHINGTON 98101

REPLY TO ATTN OF: M/S 446

FEB 23 1979

Mr. Sidney Knutson
Assistant Chief, Engineering Division
Seattle District Corps of Engineers
P.O. Box C-3755
Seattle, WA 98124

Dear Mr. Knutson:

This responds to your letter dated January 30, 1979, requesting our opinion on the impact your proposed Aquatic Plant Control Program for the State of Washington would have on the Spokane Valley-Rathdrum Prairie Aquifer (designated Sole-Source). Your letter notes that your office is preparing a draft EIS on this program and wishes to incorporate our comments in that statement.

We have had some difficulty determining from the enclosure to your letter what exactly is being asked for relative to the Spokane Valley Aquifer. Since none of the problem lakes listed in your control program are located in the aquifer recharge area, we assume your question is intended to be hypothetical. Also, since not all of the listed alternative plant control methods would impact the aquifer, we assume you desire comments relating to chemical treatment.

Any planned or intended use of aquatic plant control chemicals (herbicides) regardless of locality or purpose, is subject, as you undoubtedly know, to strict regulation. Herbicide usage in recharge areas of the Rathdrum Prairie-Spokane Valley Aquifer would be of particular concern regarding groundwater supplies and would be subject to stringent review both against Sole Source and pesticides control program criteria. The benefits of aquatic plant control relative to potential health risks due to contaminated drinking water supplies would be given particular attention.

We hope we have responded adequately to your request for our opinion on pesticide usage in the Rathdrum Prairie-Spokane Valley Aquifer area. At such time as the draft EIS on your Aquatic Plant Control Program is available, we would appreciate receiving a copy for review.

Sincerely,

Donald P. Dubois
Regional Administrator

STATE OF WASHINGTON
Dixy Lee Ray
Governor

DEPARTMENT OF AGRICULTURE
406 General Administration Building, Olympia, Washington 98504

August 4, 1978

Sidney Knutson, P.E.
Asst. Chief, Engineering Division
Department of the Army
Seattle District
P.O. Box C-3755
Seattle, WA 98124

Dear Mr. Knutson:

We have been asked to respond to a letter you sent to our director dated July 17, 1978 concerning a proposed environmental impact statement for an aquatic plant management program in the state of Washington. We will attempt to answer your questions in the order asked.

To the best of our knowledge, the following is a complete list of herbicides registered for aquatic use in Washington. If a question should arise concerning a herbicide not on this list, please inquire, as we are continually adding chemicals to our registered lists and state registration status changes very quickly.

Active Ingredient	Product	Manufacturer	EPA reg. no.
copper ethanolamine complex	Cutrine Plus	Applied Biochemists	895-10
2,4-D (octyl ester)	Transbas LV4 Brush Killer	Transbas	11687-57-37507
2,4-D (octyl ester)	Transbas LV6	Transbas	11687-28-37507
2,4-D (octyl ester)	Transbas LV4D	Transbas	11687-4-37507
2,4-D (dimethylamine salt)	Transbas A4D	Transbas	11687-6-37507
2,4-D (dimethylamine salt)	Transbas A6D	Transbas	11687-19-35707
2,4-D (sodium salt)	Aquacide Pellets	Aquacide Co.	5080-2
2,4-D (butoxyethanol ester)	AquaKleen	Amchem	264-109 AA
Simazine	Aquazine	Ciba-Geigy	100-437
Silvex	Kuron	Dow	464-162

Active Ingredient	Product	Manufacturer	EPA reg. no.
Dichlobenil	Casoron G10	Thompson-Hayward	178-726
2,3,6-Trichloropheylacetate (sodium salt)	Fenac	Amchem	264-139
Diquat	Diquat water weed killer	Chevron	239-1663
Diquat	Aquatic Contact Weed Killer	Trigon Corp.	10292-13-37594
Endothall (dipotassium salt)	Aquathall Granular	Pennwalt	4581-201-AA
Endothall (dipotassium salt)	Aquathall K	Pennwalt	4581-204
Endothall (dipotassium salt) & Silvex (potassium salt)	Aquathall Plus Granular	Pennwalt	4581-200
Endothall (dimethyl-alkylamine salt)	Hydrothall 47	Pennwalt	4581-173
Endothall (dimethylmine salt)	Hydrothall 191 Granular	Pennwalt	4581-172
Endothall (disodium salt)	Aquathall	Pennwalt	4581-139
Copper Sulfate	Medium crystals	Citco	1109-19
Copper Sulfate	Snow crystals	Citco	1109-21
Copper Sulfate	Powdered Instant Bluestone	Citco	1109-7
Copper Sulfate	Large Bricks	Citco	1109-27
Copper Sulfate	Granular crystals	Citco	1109-20
Copper Sulfate	Large crystals	Citco	1109-1
Copper Sulfate	Mountain bluestone large crystals	Citco	10103-4
Copper Sulfate	Mountain bluestone powdered	Citco	10103-1
Copper Sulfate	Mountain bluestone granular crystals	Citco	10103-9
Petroleum aromatic naptha	Chevron Aquatic Solvent	Chevron	522-39

Sidney Knutson, P.E.
August 4, 1978

There are no herbicides currently pending approval for aquatic use in the state. Dow Chemical Corporation applied for an aquatic label for DMA-4 for Eurasian water milfoil control; however, this application was withdrawn by the company prior to our action.

The procedures for authorization for use of a new aquatic herbicide vary. For a product which is EPA registered for this use, state registration procedures require submission of an application, three copies of the registered labeling and a $10 fee (this fee is waived if registration is accomplished by a government agency). Washington State Department of Agriculture then determines whether the product will be registered. All products must be registered prior to distribution into the state. For a product which is not registered for this use by the EPA, a special local needs application (under authority of Section 24(c) of amended FIFRA) may be attempted. We have enclosed an application blank for this type of registration. The registration must meet the criteria of Question 7(a), (b) or (c). As this special local needs registration is a registration which the Environmental Protection Agency has not reviewed, we may require efficacy and/or environmental safety data. The exact nature of the data required would vary with the nature of the application and the chemical proposed. We also require a draft label.

If you have any questions, please contact us.

Sincerely,

Mary Toohey

Mary M. Toohey
Pesticide Investigator

U.S. ENVIRONMENTAL PROTECTION AGENCY

REGION X

1200 SIXTH AVENUE

SEATTLE, WASHINGTON 98101

REPLY TO ATTN OF: M/S 443

AUG 1 1 1978

Sidney Knutson, P.E.
Asst. Chief, Engineering Division
Seattle District, Corps of Engineers
P.O. Box C-3755
Seattle, WA 98124

Dear Mr. Knutson:

Your letter of July 18, 1978 to Mr. Donald Dubois requesting information concerning aquatic herbicides for use on Eurasian water milfoil has been forwarded to our branch.

In response to your first question, please refer to Ms. Mary Toohey's letter dated August 4 which was a response to your letter to Mr. Mickelson. The Washington State Department of Agriculture has discretion not to register all EPA registered products but any product used in the State must be also registered by EPA. Therefore, the list she has supplied you would be those herbicides approved by EPA for aquatic use within the State of Washington.

Answering your second question, there have been no herbicide products with new active ingredients registered with EPA recently and none are pending registration action. Washington State Department of Agriculture may have registered new products for special local needs; however, new ingredients would not be included in any state registrations.

To answer your final question, Section 18 of the FIFRA gives EPA authority to exempt federal or state agencies from pesticide restrictions if emergency conditions exist that require such an exemption. Enclosed is a copy of the Section 18 regulations.

If you have additional questions relating to pesticides, please contact Jonathan Heller at 399-1090.

Sincerely,

Alexandra B. Smith

Alexandra B. Smith, Chief
Environmental Evaluation Branch

Enclosure

STATE OF WASHINGTON
Dixy Lee Ray
Governor

DEPARTMENT OF AGRICULTURE
406 General Administration Building, Olympia, Washington 98504

September 20, 1978

Bob Rossen
Dept. of Army
Seattle District Corps of Engineers
P.O. Box C-3755
Seattle, WA 98124

Dear Mr. Rossen:

As we discussed over the telephone September 19, the following are some herbicide materials registered for use in the aquatic environment in Washington state in 1978. These materials were inadvertently left out of my letter of my letter of August 4, 1978 to Sidney Knutson.

Active Ingredient	Product	Manufacturer	EPA reg. no.
2,4-D dimethylamine salt	Vegatrol 6D	Velsicol	876-221
2,4-D dimethylamine salt	Vegatrol A-4D	Velsicol	876-222
2,4-D butoxyethyl ester	Vegatrol BE-4D	Velsicol	876-217
2,4-D isooctyl ester	Vegatrol LV-4D	Velsicol	876-218
silvex isooctyl ester	Vegatrol LV-4TP	Velsicol	876-227
2,4-D isooctyl ester	Vegatrol LV-6D	Velsicol	876-232
diquat	Vegetrol	Mantek	1769-174-10272
silvex isooctyl ester	Ded-weed Silvex LV	Thompson-Hayward	148-479

Sincerely,

Mary Toohey

Mary Martin Toohey
Pecticide Investigator
Grain & Chemical Division

MMT/s

STATE OF
WASHINGTON
Dixy Lee Ray
Governor

DEPARTMENT OF AGRICULTURE
406 General Administration Building, Olympia, Washington 98504

April 12, 1979

Bob Rossen
Dept. of Army
Seattle District Corps of Engineers
P.O. Box C-3755
Seattle, WA 98124

Dear Bob:

Have found six more aquatic herbicides to add to the list of registered products in Washington State. These are:

Registrant	Product	EPA reg. no.	Ingredient
Vertac, Inc.	Brush-Rhap LV4D	39511-58	Octyl ester 2,4-D
Vertac, Inc.	Weed-Rhap A4D	39511-64	Dimethylamine salt of 2,4-D
Vertac, Inc.	Weed-Rhap LV4D	39511-75	Octyl ester 2,4-D
Vertac, Inc.	Weed-Rhap LV Granular D	39511-77	Octyl ester 2,4-D
Mor-Gro Chemical	Wasco Water Weed Killer	168-11	Benzene hydrocarbons
USS Agrichemicals	USS 2,4-D Amine 4	359-311-3442	Dimethylamine salt of 2,4-D

Sincerely,

Mary Toohey

Mary Martin Toohey
Assistant Pesticide Registrar
Grain & Chemical Division

MMT/s
cc: S. V. Kulkarni

STATE OF WASHINGTON
Dixy Lee Ray
Governor

DEPARTMENT OF FISHERIES
115 General Administration Building, Olympia, Washington 98504 206/753-6600

July 6, 1978

Seattle District
Corps of Engineers
P.O. Box C-3755
Seattle, Washington 98124

Attention Mr. Sidney Knutson, P.E.

The Department of Fisheries has reviewed the description of the Aquatic Plant Management Program attached to your June 15, 1978 letter. Our comments are as follows.

The Washington Department of Fisheries has the responsibility to preserve, protect, perpetuate and manage the foodfish and shellfish resources of the State. All five salmon species under our jurisdiction are dependent on fresh water for upstream and downstream migration, spawning, egg incubation, and juvenile rearing ranging from a few days to over a full year depending on the species. Thus, we are concerned about possible losses of critical fresh water habitat from the spread of Eurasian water milfoil. Based on our present knowledge of water milfoil, it seems reasonable that these losses of critical habitat could include physical losses of vital shallow water rearing areas and spawning gravels in the lakes and streams. In addition, there may be a potential for loss of sport fishing area from this nuisance plant. We know of no studies which document the impact of Eurasian milfoil on salmon bearing waters and would therefore look with interest on the documentation of the suspected impact.

While we are concerned that Eurasian milfoil may constitute a threat to the salmon resources under our jurisdiction, several of the "Possible Control Methods Being Considered" (part 3) may have adverse effects on salmon resources in milfoil infested waters. We are concerned about the effect of 2,4-D on salmon. To date, the Department of Fisheries has not seen enough definitive data on the potential effects on salmon of all forms of 2,4-D proposed for use. One study reviewed by our department (Meehan, W.R., L.A. Norris, and H.S. Sears. 1974. Toxicity of various formulations of 2,4-D on salmonids in southeast Alaska. Journal Fisheries Research Board of Canada 31:480-485.) showed high mortality to salmon fry in toxicity tests conducted with two ester froms of 2,4-D. The butoxyethonal ester compound was not tested. The Department of Fisheries cannot support the use of 2,4-D to treat milfoil when salmon are present in the treated areas until we have seen data on the effects of the specific chemical proposed for use on different types of salmon, i.e., both fry and fingerlings.

Seattle District
Corps of Engineers

July 6, 1978

Treatment of milfoil with 2,4-D has been proposed for Lake Washington by METRO as part of an experimental study on milfoil control methods. The Department of Fisheries requested bioassay work with salmon and 2,4-D prior to offering our support to the proposal. We likewise reserve our endorsement of the 2,4-D portion of the Corps of Engineers proposal until the results of bioassays are available.

Control measure "f" lake drawdowns, would also be unacceptable to the Department of Fisheries in some circumstances. Fish transportation, juvenile salmon rearing in the shallows as well as lake shore spawning populations of sockeye could be severely impacted by improper or poorly timed lake drawdowns.

We have no rare or endangered species under our jurisdiction in any of the areas listed which could be endangered by the proposed project.

Thank you for the opportunity to comment. We will anticipate the draft EIS on the proposal for review.

Sincerely,

William R. ...

Gordon Sandison
Director

mr

cc: Game

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
2625 Parkmont Lane, S.W., Bldg. B-3
Olympia, Washington 98502

August 29, 1978

Colonel John A. Poteat, Jr.
District Engineer
Seattle District, Corps of Engineers
P.O. Box C-3755
Seattle, Washington 98124

Dear Colonel Poteat:

This is our planning aid letter containing preliminary information and comments on potential effects to fish and wildlife resources of your proposed Aquatic Plant Management Program for Washington State. This letter is being submitted in partial fulfillment of Section 2(b) of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.). Our comments address only limited facts of the Plan and are subject to revision as we obtain more information. They are intended as timely input to your planning process, including preparation of a draft environmental impact statement and state design memorandum as authorized by Section 302 of the River and Harbor Act of 1965 (P. L. 89-298).

This material is based on very limited project information received from your office through August 22, 1978. Additional information on effects of Eurasian watermilfoil and various control techniques was obtained from telephone interviews with knowledgable people; a field trip with Corps personnel to survey milfoil control activities in British Columbia; and some review of the literature. Brief coordination meetings were also held with personnel from Washington Departments of Fisheries (Earl Finn and Mary Lou Mills) and Game (Ken Tupper and Jack Ayerst).

At the July 25, 1978 Fish and Wildlife coordination meeting, we were asked by your staff to emphasize the following in this letter: preliminary recommendations concerning control methodologies; red flag possible problem areas; potential effects to threatened and endangered species; and opportunities to enhance fish and wildlife resources.[1]

<u>Project Description</u>

At this time the project consists of a study to determine the need for establishing a comprehensive program for the management of aquatic plants

within the State of Washington. The principal target aquatic plant is Eurasian watermilfoil (referred to in this letter as milfoil). The study includes consideration of various control measures for currently infested waters and prevention measures to insure that milfoil does not spread to noninfested waters. The Corps has not yet decided which water bodies, or portions thereof, would be subject to control measures, but Lake Washington, Lake Union, Lake Sammamish, and Banks Lake are of prime concern. Preventive action is being considered for Osoyoos Lake, the Columbia River system, and other waters within the State.[2] If implemented, the plant management program would be administered by the Washington State Department of Ecology, with cost sharing on a 70 percent Federal-30 percent state basis.

Eurasian watermilfoil (Myriophyllum spicatum L.) is a rooted perennial with long, flexible stems and finely dissected leaves. During the spring and summer months rapid growth from the root crown area produces reddish shoots that may reach the surface and flower in water up to 12 feet deep. Dense populations may occur in depths up to 15 feet and on a variety of bottom types, including silt, sand, and even gravels and broken rock. The plants are spread rapidly by floating stem fragments produced by waves and human disturbance. These fragments are carried by water currents and winds so that populations are difficult to contain. New plants grow when the fragments sink or drift ashore.

Eurasian watermilfoil is not native to North America, but occurs widely in Asia, Africa, and Europe. The history of its introduction and spread in North America, and to British Columbia, is poorly known. Major infestations of this plant, some covering hundreds of thousands of acres, have occurred in Chesapeake Bay, the reservoirs of the Tennessee Valley Authority, in Florida and in Texas. Eurasian watermilfoil has recently appeared in Quebec, Ontario, the Okanagan Valley of British Columbia and now, in Washington State.[3] It should be noted that problems created by milfoil result from its abundance rather than simply its presence, and invasions of milfoil do not always lead to major infestations.[4]

There is a wide difference of professional opinion on the need to control milfoil. Some biologists familiar with the explosive growth potential shown by milfoil in other parts of the country are adamant about the need to eliminate milfoil in Washington State before it becomes firmly established (Chuck Walker, USFWS, personal communication, 8/24/78). Others are not convinced that milfoil will be as successful in Washington State as it has been elsewhere (Mike Robinson, B. C. Fish and Wildlife, personal communication, 8/2/78). Public opinion is also divided. In the Seattle area, for example, "Some citizens believe milfoil and other aquatic plant growth is a nuisance - heavy milfoil can impair swimming, boating, and other water sports. Others believe milfoil provides a good habitat for birds, fish, and other waterliving animals."[5]

Effects of Milfoil on Fish and Wildlife Resources

Milfoil definitely has the potential to alter or destroy both fish and wildlife aquatic habitat. However, in our preliminary review we have been unable to document any adverse effects of milfoil on either fish or wildlife in Washington State or similar areas.

The Corps Aquatic Plant Management Program, State of Washington Reconnaissance Report, August 1977, is incorrect in stating that 30 percent of prime Canadian Okanagan spawning beds are detrimentally impacted by milfoil (p. 4). Actually, field studies by British Columbia's Fish and Wildlife have been unable to find a conflict between kokanee spawning and milfoil. In most cases the distribution of the plant in relation to fish spawning areas is such that it is unlikely there will ever be a problem. Their studies have also shown that milfoil has a beneficial impact on waterfowl in most situations (Mike Robinson, personal communication, 8/2/78). The recon report also mentions fish kills as a result of lowered dissolved oxygen during night respiration by milfoil (p. 4). Such an occurrence would be quite unlikely in any area with cold, flowing water. Kills might occur, however, in areas of standing water.

Thus, based on information now available to us, we foresee no adverse impacts of milfoil on rare or endangered fish and wildlife species in Washington State. Milfoils' potential for crowding out other plants presents the possibility of adverse effects on rare or endangered aquatic plants.

At this time, perhaps the greatest threat to fish and wildlife from milfoil is the uncontrolled citizen use of herbicides in efforts to control the plant. A fish kill has already been reported in Lake Washington as a result of Casaron treatments by unknown individuals (Jack Ayerst, WDF, personal communication).

Milfoil may affect human use and enjoyment of fish and wildlife resources. Effects are perceived as either beneficial or detrimental depending on one's perspective (e.g. birdwatching - beneficial due to increased numbers of birds; fishing - detrimental due to impaired access).

The remainder of the Corps transfer funds for this project will be primarily used to further explore the potential effects of milfoil on fish and wildlife resources.

Effects of Milfoil Control Methods on Fish and Wildlife

Potential control techniques need to be considered not only in terms of their immediate impact(s) on aquatic ecosystems, but also in relation to the potential impact of the "no action" alternative. No one technique will be appropriate for all waters of the state; each milfoil infestation will have to be evaluated not only as to the need for but also the means of control. These evaluations will require field studies to identify critical areas and time periods that will have to be avoided for protection of fish and wildlife resources.

Five major categories of aquatic plant control techniques are under consideration: chemical, mechanical, biological, environmental manipulation, and integrated measures. Possible problem areas and opportunities for fish and wildlife enhancement for each of these major categories are discussed below.

Chemical

The Corps Strawman Aquatic Plant Management Plan for the State of Washington[6] considers four control chemicals: 2,4-D-DMA, 2,4-D-BEE, Diquat, and Endothall acid. It recommends immediate consideration of the use of 2,4-D-DMA as the control treatment of choice (p. 23). The Strawman Report incorrectly states that "Except for differences in cost, no reason exists for ranking either of the 2,4-D formulations over the other." (p. 14). In fact, each formulation has a unique advantage: 2,4-D-DMA liquid is less toxic to aquatic organisms, while 2,4-D-BEE granules concentrate the herbicide near the milfoil roots, thus minimizing drift away from the treatment area. On page 19, the Strawman Report states that Diquat has not been approved for use in water. This chemical has been registered by EPA for use in water for aquatic weed control for a number of years and has been used extensively in the United States for that purpose (Tom Jackson, USFWS, personal communication, 8/2/78). It is also a commonly used fish disease treatment.

Use of 2,4-D is definitely a potential problem area should it be decided to implement a milfoil control method. Objections to its use center around the lack of assurance that it will not adversely impact non-target organisms. The Washington State Department of Fisheries has stated "While we are concerned that Eurasian milfoil may constitute a threat to the salmon resources under our jurisdiction, ... [we] cannot support the use of 2,4-D to treat milfoil when salmon are present in the treated areas until we have seen data on the effects of the specific chemical proposed for use on difference types of salmon, i.e. both fry and fingerlings."[7]

It is likely that before use of 2,4-D will be either biologically or politically acceptable in this state, bioassays using various life stages of potentially exposed organisms will have to be conducted. If 2,4-D is accepted for use, there will probably still be a need for site and timing restrictions.

Mechanical

Three mechanical milfoil control methods are: harvesting, diver-operated dredge, and rotovating. Harvesting is mainly a cosmetic treatment, and can actually cause spread of the plant if all fragments are not removed from the water. It does have the advantage of removing nutrients from the system.

The diver-operated dredge, although expensive to operate, is nearly 100 percent effective in removing milfoil. It does result in localized turbidity and destruction of benthic and epiphytic organisms. Water quality effects would depend on the quality of the sediments being disturbed. If dredged sediments are removed from the system there could be a problem with locating environmentally acceptable disposal sites.

Rotovating is a fairly new technique being used with up to 95 percent effectiveness in British Columbia. It disturbs benthic organisms but does not necessarily destroy them. Use of these mechanical methods would have to be timed on a site-specific basis to avoid critical nesting and spawning periods.

There are indications that milfoil will not grow in clean sediment-free gravel. If this proves true, there might be an opportunity to enhance salmon spawning gravels and control/prevent the spread of milfoil in one operation. A prototype instream gravel-cleaning machine is now being developed under contract for the Department of Fisheries. Placement of clean gravel or rock is also a possibility.

Biological

There are presently no proven biocontrol agents cleared for use in controlling milfoil. Two potential agents, white amur (also known as grass carp (*Ctenopharyngodon idella*) and a host-specific insect (*Paraponyx stratiotata* L.) are currently being investigated in the research program for future operational application.[9]

The Game Code for the State of Washington (WAC-232-12-670) designates grass carp as a deleterious species, thus making it illegal to bring live specimens into the state. The State Fisheries Department also has regulations regarding the introduction of fish based on RCW 75.16.020.

Environmental Manipulation

Drawdown of water level is a proven method for milfoil control. Effectiveness varies with duration and seasonal timing of the drawdown, as well as the exposed soil's ability to hold water. One problem with this method is milfoil's ability to produce a terrestrial form that can reinfest the area when it is reindundated.

In some instances drawdown can also benefit fish by forcing spawners to lay their eggs at lower elevations, thus protecting the incubating eggs from desiccation during low water levels. This double-benefit technique is now being tried experimentally by the U.S. Bureau of Reclamation at Banks Lake. Drawdowns would have to be carefully timed to avoid dewatering of incubating eggs or creation of land bridges for predator access to waterfowl nesting islands. In addition, drawdowns will probably have to be limited to areas that already have water level control structures, because it is unlikely the Department of Fisheries will approve any new control structures in areas with anadromous fish populations (Earl Finn, WDF, personal communication, 8/24/78).

Another environmental manipulation technique under consideration is the use of a plastic screening material placed just above the substrate to reduce the amount of light reaching the milfoil. The effectiveness of "Aquascreen" is now being tested by METRO in Union Bay. This method appears to be biologically acceptable, depending on the amount of area affected.

Integrated Methods

Integrated methods could include any combination of the four major technique categories described above. For example, a combination of maintenance 2,4-D treatments (i.e. lower levels of herbicide than normally needed to reduce colonies from a high level to a low level) and high frequency, short duration winter drawdowns seems to be the most effective and economical technique for control of milfoil in one of TVA's reservoirs.[10] Observations in the Canadian control program indicate that harvesting may improve the effectiveness of subsequent rotovating or herbicide applications.[11] Biological effects would be similar to those discussed for individual treatments, although there is a possibility for adverse synergistic effects.

Effects of Milfoil Prevention Methods on Fish and Wildlife

While resource managers await documentation on the need to control milfoil in Washington State, prevention of the spread of current infestations certainly seems to be a reasonable course of action. Effective preventive

action taken now will reduce the magnitude and cost of any future control measures. The Corps is considering three potential preventive measures: downstream barriers, regular surveillance of critical areas, and public education.[2] Barriers should be designed to avoid interference with fish passage. Otherwise, none of these options should have an adverse impact on fish or wildlife resources.

Another preventive technique that may be appropriate in some waters of the state is improvement of water quality; milfoil has been shown to grow better in waters with a high nutrient content. Such water-cleanup activities would have a beneficial effect on aquatic ecosystems.

Comments on Known Areas of Milfoil Infestation

Our files contain limited information on specific environmentally sensitive areas of the lakes on the July 5, 1978 Corps list of known areas of milfoil infestation. We have attached a map of Lake Washington showing potentially critical wetland areas under study by our office (Figure 1).

The Banks Lake infestation merits special mention because of its future tie-in with the lower Columbia drainage. This will expose a large area of vital fish and wildlife habitat, including the Columbia River estuary, to any potential adverse impacts of the plant.

Preliminary Recommendations

1. The Corps should carry out the milfoil survey procedure described in the Strawman Report.[6] This will allow the early documentation of problem areas and timely control measures.

2. The Corps should postpone their final decision on the need to control Eurasian watermilfoil until the Waterways Experimentation Station team has completed its survey of the potential habitat area available to the plant in this state.

3. Preventive measures should be implemented as soon as possible to prevent the spread of the plant, with an emphasis on public awareness.

4. If the decision is made to use chemical control methods, bioassays on acute and chronic effects of chemicals under consideration should be carried out on various life stages of appropriate non-target organisms. Any experiments should be designed to complement information already in the literature and similar studies being planned by METRO. State and federal fish and wildlife agencies should be involved at the experimental design stage so that they will

accept test results as being meaningful for use in their decision-making.

We appreciate the cooperation given to our biologist by your staff. If you have any questions regarding any of the above material, please contact Nancy Nelson of our Olympia Ecological Services Office (FTS 434-9440).

Sincerely,

Charles M. Chambers
Acting Field Supervisor

Attachment
NCNelson:fs

cc: See attached distribution list.

Distribution List

U.S. Bureau of Reclamation
ATTN: Bob Leonard
Box 815
Ephrata, WA 98823

Environmental Protection Agency
Mail Stop 521
1200 Sixth Avenue
Seattle, WA 98101

Washington Department of Ecology
ATTN: Barbara Blau
MS PV-11
Olympia, WA 98504

Municipality of Metropolitan
ATTN: Bob Matsuda
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Seattle, WA 98104

Friends of the Earth
ATTN: Gil Zemansky
4512 University Way N.E.
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Mr. Gary Herron
Park Manager
Steamboat Rock State Park
P.O. Box 352
Electric City, WA 99123

Dr. Peter Newroth
Water Investigations Branch
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National Marine Fisheries Service
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Washington Dept. of Fisheries
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Olympia, WA 98504

Washington Department of Game
ATTN: Jack Ayerst & Ken Tupper
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Olympia, WA 98504

Wash. Environmental Council
ATTN: Helen Engles
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Seattle, WA 98104

Mr. Tom Jackson
U.S. Fish & Wildlife Service
CN FRL Field Research Station
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Denver Federal Ctr. Code 1522B
Denver, CO 80225

Mr. Ernie Hesser
Walla Walla District
Corps of Engineers
Bldg. 602, City-County Airport
Walla Walla, WA 99362

References

1. Bob Rawson, Corps of Engineers, memo to the record regarding July 25, 1978 FWS coordination meeting; dated August 8, 1978; 2 pp.

2. Corps of Engineers, Seattle District; Aquatic Plant Management Program State of Washington; NPSEN-PL-ER, June 12, 1978, 2 pp.

3. "Eurasian Watermilfoil in the Okanagan Valley", pamphlet; Water Investigations Branch, Ministry of the Environment, Province of British Columbia, Canada.

4. Grace, J. B., and R. G. Wetzel, 1978. The production biology of Eurasian watermilfoil (Myriophyllum spicatum L.): A review. J. Aquat. Plant Manage. 16:1-11.

5. METRO; 1978; Aquatic plants: METRO surveys growth in area lakes, bays; Monitor, July 1978, p. 4.

6. Corps of Engineers, Seattle District; Strawman Aquatic Plant Management Plan for the State of Washington. Prepared by Environmental Laboratory, Aquatic Plant Research Branch, U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi; 51 pp.

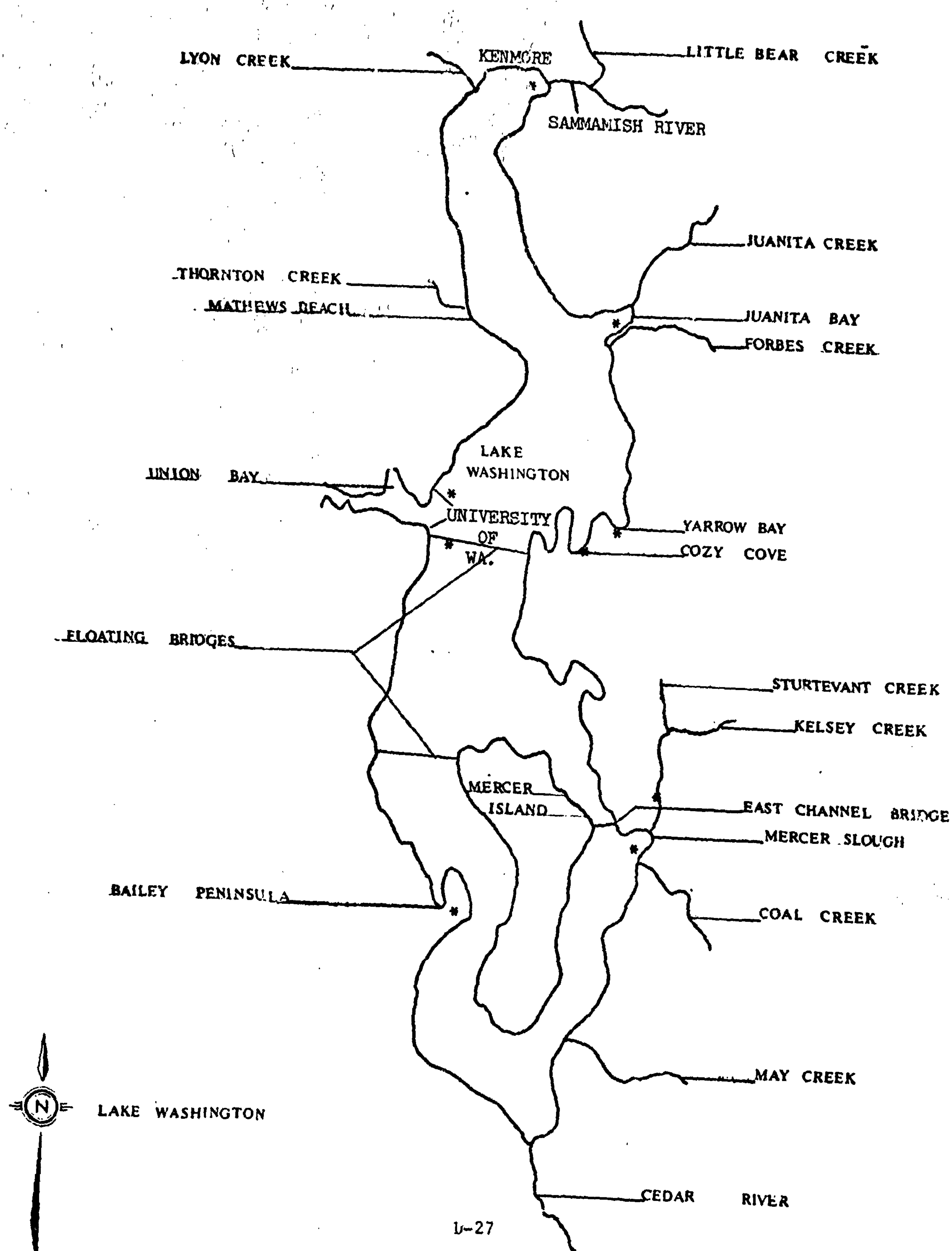
7. July 6, 1978 letter from Gordon Sandison, Director, Department of Fisheries to Sidney Knutson, Corps of Engineers, Seattle District.

8. "Some Facts about 2,4-D for the control of Eurasian watermilfoil." pamphlet. Water Investigations Branch, Ministry of the Environment, Province of British Columbia, Canada.

9. Sanders, D. R., 1977. The management of Eurasian watermilfoil (Myriophyllum spicatum L.) in the Seattle, Washington area. Department of the Army Waterways Experiment Station, Corps of Engineers, Vicksburg, Mississippi. August 17, 1977 memo.

10. Goldsby, T. L., A. L. Bates, and R. G. Stanley, 1978. Effect of water level fluctuation and herbicide on Eurasian Watermilfoil in Melton Hill Reservoir. J. Aquat. Plant Manage. 16:34-38.

11. Information Bulletin, Aquatic Plant Management Program Okanagan Lakes. Vol. II: Summary of Program Results for 1977. Water Investigations Branch, Ministry of the Environment, Province of British Columbia, Canada.



* WETLANDS OF IMPORTANCE ASSOCIATED WITH LAKE WASHINGTON

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Environmental & Technical Services Division
P. O. Box 4332, Portland, Oregon 97208

October 2, 1978

Colonel John A. Poteat
District Engineer, Seattle District
Corps of Engineers
P. O. Box C-3755
Seattle, Washington 98124

Re: NPSEN-PL-ER

Dear Colonel Poteat:

We have reviewed the Strawman Aquatic Plant Management Plan for the State of Washington that was sent to us with an August 25, 1978, letter from Lt. Colonel Carpenter. We offer the following comments on the plan for your consideration:

On page 11, paragraph 17 and on page 13, paragraph 21 the plan suggests the use of the fish white amur and/or tilapia as biological methods to control the spread of the aquatic plant Eurasian Watermilfoil. According to biologists of the Washington Department of Fisheries, their regulations prohibit the importation and release of these species into waters of the State of Washington. This method of biological control would not be a possible control alternative.

In Table 1 (page 42) User Interests and Demands on Washington Water Systems under the subheading Recreation, Fisheries management, there is a statement "Total Toxin accumulation not to exceed one-tenth of the 96-hour median tolerance limit of *Pimephales promelas* (flathead minnow) and/or *Lepomis macrochirus* (bluegill)." These fish would not be acceptable by the National Marine Fisheries Service as test species in the Pacific Northwest. We would prefer using salmonids that are indigenous to the body of water to be treated.

We are of the opinion that control of exotic waterweeds is necessary and support their control by means that do not adversely affect resident or anadromous fish populations.

Sincerely,

Dale R. Evans

Dale R. Evans
Division Chief

cc: Washington Dept. of Fisheries
Washington Dept. of Game
Environmental Protection Agency, MS 521
Fish & Wildlife Service, ES, PFO

STATE OF WASHINGTON
Dixy Lee Ray
Governor

DEPARTMENT OF FISHERIES
115 General Administration Building, Olympia, Washington 98504 206/753-6600

February 16, 1979

Mr. Robert Rawson
Seattle District Corps
of Engineers
P.O. Box C-3755
Seattle, Washington 98124

Dear Mr. Rawson:

You have requested information on the Department of Fisheries recommendations for timing of 2,4-D applications into State waters. Unfortunately we have too many proposals presently before us to supply you a complete package at this time. We are also working with the Department of Ecology and other governmental units to supply solutions to the problem of Eurasian water milfoil control.

Enclosed are two letters which recommend timing for Lake Osoyoos and Lake Washington (specifically Union Bay) respectively and some rationale for the protection of salmon only. Also enclosed is some information on our 1978 hatchery production and timing of releases into Lake Samamish adjacent to the state park. We are presently waiting for METRO's literature review on 2,4-D toxicity and the opportunity to supply consultation to the Department of Ecology's Draft EIS for Lake Washington. Please keep us informed on the Corps of Engineers Aquatic Plant Control Program. If you need any further information, please contact Mr. Earl Finn at 753-3629.

Sincerely,

Gordon Sandison
Director

jp

cc: Bob Matsuda - METRO
Merley McCall - DOE
Jack Ayrest - WDG
Dave Heiser - State Parks

JS:LB:js
cc. Bailey
Finn
Central Files

WASHINGTON
Dixy Lee Ray
Governor

DEPARTMENT OF FISHERIES
115 General Administration Building, Olympia, Washington 98504

May 1, 1978

Dr. W.E. Johnson
Environment Canada
Fisheries - Pacific Region
1090 West Pender Street
Vancouver, B.C. V6E 2P1

Attention M. Nassichuk

Dear Dr. Johnson:

The State of Washington Department of Fisheries is in receipt of your April 7, 1978 letter requesting information regarding the use of herbicide 2,4-D to control Eurasian water milfoil in Osoyoos Lake. We have the following comments.

Populations of Eurasian water milfoil have been documented in several lakes in Washington, including Lake Osoyoos. Treatment of milfoil with 2,4-D has been proposed for Lake Washington as part of an experimental study on milfoil control methods. The Department of Fisheries requested bioassay work with salmon and 2,4-D prior to offering our support to the proposal. Unfortunately, the biossay studies planned were subsequently cancelled, along with the plans to use 2,4-D.

To date, the Department of Fisheries has not seen enough definitive data on the potential effects on salmon of all forms of 2,4-D proposed for use. One study reviewed by our department (Meehan, W.R., L.A. Norris, and H.S. Sears. 1974. Toxicity of various formulations of 2,4-D on salmonids in southeast Alaska. Journal Fisheries Research Board of Canada 31:480-485.) showed high mortality to salmon fry in toxicity tests conducted with two ester forms of 2,4-D. The butoxyethanol ester compound was not tested. The Department of Fisheries cannot support the widespread use of 2,4-D to treat milfoil when salmon are present in the treated areas until we have seen data on the effects of the specific chemical proposed for use on different types of salmon, i.e., both fry and fingerlings.

We suggest that, if possible, you consider conducting biossays with fry and/or fingerling sockeye in conjunction with the upcoming treatment program to establish toxic and safe levels of butoxyethanol ester 2,4-D. Perhaps the International Pacific Salmon Fisheries Commission's research facility at Cultus Lake could accomodate such tests. The bioassays conducted in the laboratory might be supplemented with live box tests with sockeye inside and outside the treatment zones during the 2,4-D treatment program.

Dr. W. E. Johnson

May 1, 1978

In your letter to us you also requested information on the rearing dynamics of juvenile sockeye populations in Osoyoos Lake. Sockeye zeros enter the lake from March through May. In July these fish move out of the shoreline areas of the lake to deeper water due to high water temperatures at the shore. Sockeye yearlings leave Osoyoos Lake in the months of April and May. It is the Department of Fisheries' opinion that the least detrimental time for 2,4-D application in Osoyoos Lake would be the months of July and August since sockeye would not be present in the shallow areas of the lake during those months.

Herbicide treatment of milfoil took place in July, 1977 in Osoyoos Lake at a site just south of the U.S. - Canada border. The Department of Fisheries did not object to the use of 2,4-D in Osoyoos Lake at that time of year because sockeye were in the deeper areas of the lake rather than in the treated area. The Washington State Department of Fisheries cannot support the use of 2,4-D in state waters when salmon are present until we have sufficient information to properly define the effects of specific proposed applications on the resources under our jurisdiction.

The Department of Fisheries is interested in reviewing any information your agency obtains on the effects of the butoxyethanol ester form of 2,4-D on salmon species. We look forward to continued correspondence with your department. If we can be of further assistance, do not hesitate to contact us.

Sincerely,

William Frost

Gordon Sandison
Director

js

cc: Tom Meekin

3:S
Bailey ✓
Thurow
Fiscus

STATE OF WASHINGTON

DEPARTMENT OF FISHERIES

115 General Administration Building, Olympia, Washington 98504 206/753-6600

Dixy Lee Ray
Governor

July 29, 1977

Mr. John F. Spencer, Assistant Director
Office of Water Programs
Department of Ecology
Olympia, Washington 98504

Dear Mr. Spencer:

On July 12, 1977 department staff participated in an aquatic plant workshop presented by the Department of Ecology and the U.S. Army Corps of Engineers. The purpose of the workshop was to share information on the control of Eurasian water milfoil with emphasis on a proposed control program for Union Bay on Lake Washington.

As you are probably aware, Union Bay is adjacent to a vitally important transportation zone for both upstream and downstream migrating salmonids. The proposed use of 2,4-D to destroy Eurasian water milfoil must be carefully controlled to keep concentrations in the treated area low, to prevent the chemical from reaching fish carrying waters, and to avoid treatment during salmonid fish abundance.

There is a lack of supportive evidence on the low toxicity of 2,4-D to Pacific salmon, therefore we recommend the following precautions be taken to minimize the chance for prpblems:

1. Use 2,4-D only in areas of poor salmon habitat and low utilization like Union Bay.

2. Do not exceed the minimum levels needed for effective weed treatment throughout the water column to minimize toxicity to any salmonids that might be in the area.

3. Consider containing the 2,4-D within the application area until it is naturally detoxified.

4. Apply 2,4-D during the first two weeks of August when salmonid populations are relatively low (see attached figure).

5. Use a one-time each year application rather than several applications spread over time.

John Spencer July 29, 1977

We agreed to the use of 2,4-D in Lake Osoyoos primarily because there were no salmon in the treated area at the time of application. The use of chemicals in Lake Washington is more difficult to accept because of the overlap in timing of migrations. In Lake Washington we may request a monitoring program.

We support the Department of Ecology and other groups on the need to control or eradicate this significant aquatic plant problem in Washington streams and lakes. From a salmon standpoint we can envision possible loss of spawning and rearing areas in the Lake Washington system from this nuisance plant. We would be especially interested to review the aerial photographs proposed by the Corps and relate the existence of milfoil to known sockeye salmon spawning beaches in Lake Washington and Lake Sammamish.

Thank you for the opportunity to comment and we will appreciate the opportunity for further input during the planning stage.

Sincerely,

William Rees

Gordon Sandison
Director

sg

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
2625 Parkmont Lane, S.W., Bldg. B-3
Olympia, Washington 98502

February 20, 1979

Colonel John A. Poteat, Jr.
District Engineer
Seattle District, Corps of Engineers
P.O. Box C-3755
Seattle, Washington 98124

Dear Colonel Poteat:

This planning aid letter contains preliminary information on present economic effects of aquatic plant infestations and of your proposed Aquatic Plant Management Program for Washington State. This letter is being submitted in partial fulfillment of Section 2(b) of the Fish and Wildlife Coordination Act (48 Stat 401, as amended; 16 U.S.C. 661 et seq). These comments are intended as input to your planning process, including preparation of an environmental impact statement and state design memorandum as authorized by Section 302 of the River and Harbor Act of 1965 (P.L. 89-298).

This material is based on information received through phone and personal conversations with Washington State Department of Game and Department of Fisheries staffs and with representatives of the National Marine Fisheries Service. Information requested was: (1) have there been any economic losses to fish resources or to sport and commercial fishing through boating access restrictions, inability to control lures or land fish or dispersal of fish from fishable waters and if so, what would they estimate to be the annual loss; and (2) what losses, either through loss of fish, loss of habitat and good fishing areas is anticipated from plant control programs?

Washington Department of Game does not believe that milfoil infestations have created any economic losses to resident game fish or to the fisheries at this time. They do, however, express concern over potential future impacts, especially in smaller lakes, through boating restrictions, loss of usable habitat because of excessively dense growths that can restrict necessary fish migrations to shallow areas for spawning, and O_2 losses through natural die-backs that are known to occur in aquatic macrophytes.

Washington Department of Fisheries and NMFS are concerned over restrictions to anadromous fish migrations through excessively dense milfoil infestations and with increased predation because of the improved spiny-ray habitat the milfoil generates. They have not been able to document any economic losses at this time.

A major concern of all resource managers is the propensity for milfoil to spread and the impacts it could have in some waters not presently infested. Since this is speculative concern, there is no way to derive a dollar or resource loss figure.

The second concern, impacts of plant control programs on fish, wildlife or associated recreational pursuits, was even more difficult to examine. At present, the Corps proposed project is not clear either to the extent of the project or the control techniques to be employed.

There is still differences of opinion regarding different forms of chemical control. Some agency representatives are willing to accept existing data on 2,4-D formulations and their effectiveness to control milfoil as well as the associated impacts to fish species, while others are not. There did appear to be a mutual concern for the non-selective habitat impacts of mechanical control measures. As the program reduces in scope, the potential impacts and, therefore, concerns are lessened.

All agency representatives were reluctant to estimate potential losses to fish, habitat or related recreation until the scope, methods, and controls, i.e. who does the work and under what guidelines, are determined. If the current program to treat isolated pockets of milfoil, consisting of a total of approximately 100 acres or less, on the west side (Lake Washington, Sammamish, Union Bay) becomes the final project, the impacts and economic losses will be minimal.

Compensation and Mitigation:

Current fish, habitat and recreational losses caused by milfoil infestations and the anticipated effects of the limited existing proposal are minimal. Therefore, site specific mitigation needs will be negligible and will be dependent on the final locations to be treated and the techniques to be implemented.

If the program ultimately becomes an on-going plant management program it will require an on-going contingency program to monitor milfoil spread and possible impacts resulting from control. This would involve organization and training of state, federal, and county employees to place qualified persons throughout the state. If the control program is to be federally funded through the Corps of Engineers then we believe the contingency program should also be organized and coordinated by you.

Since there is little site specific data on the effects of different types of plant control techniques, we believe a research monitoring program should be established to evaluate negative and positive impacts of each technique used. This should include acute toxicity tests on Lake Washington run salmonids using chemicals registered for milfoil control. These programs are needed to determine if assumptions, extrapolated from data accumulated elsewhere, are valid or if modifications to the control programs would be needed to protect resources.

We appreciate the cooperation given to us by your staff. If you have any questions please contact Rex VanWormer of our Ecological Services Office (FTS 434-9440).

Sincerely,

George L. Capp

George L. Capp
Field Supervisor

STATE OF WASHINGTON
Dixy Lee Ray
Governor

DEPARTMENT OF FISHERIES
115 General Administration Building, Olympia, Washington 98504 206/753-6600

April 24, 1979

Ms. Rosemary Walrod
Department of Ecology
Mail Stop PV - 11
Olympia, Washington 98504

Dear Ms. Walrod:

General Comments

The Washington Department of Fisheries (WDF) has reviewed the draft Environmental Impact Statement (EIS) for Control of Watermilfoil in areas of Lake Washington. We would like to take this opportunity to describe our concerns, involvement, policies, and recommendations for control of this nuisance plant. The department recognizes a need to control milfoil in certain areas of the state but at the same time must be reasonably assured that chosen control measures do not impact foodfish resources.

Eurasian milfoil is unsightly, presents a potential hazard to swimmers and may interfere with water skiing. Mechanical harvesting, covering the substrate with screens, and herbicide application are the three popular control measures. The first two appear only partially successful while herbicide use appears to be the best for milfoil eradication to date. However, herbicides are toxic to fish. No impacts to salmon are expected from the physical control methods, if properly conducted.

Since the problem was identified in about 1977, the Department of Fisheries has responded to proposed in-water herbicide use in the following manner attempting to endorse milfoil control but at the same time protecting our resources (Duties of the department RCW 75.08.012):

1. Respond favorably to use of 2,4-D in non-salmon areas, e.g., Banks Lake.
2. Respond favorably to use of 2,4-D in salmon areas if the application is timed between salmon migrations, e.g., Lake Osoyoos-Okanogan River.
3. Respond negatively if 2,4-D is proposed for application during major salmon migration periods adjacent to major migration routes, e.g., Union Bay adjacent to the ship canal and the mouth of Issaquah Creek below the hatchery.

However, in 1978, we agreed to the use of 2,4-D in Union Bay if the proponent (METRO) assured us through bioassay that the application would not directly impact salmon. We understand that after about a year of planning, the bioassay was eliminated because the interagency Technical Review Committee for the Union Bay Milfoil Demonstration Study concluded the available funding was not adequate to thoroughly evaluate that portion of the overall study.

Since METRO's ongoing literature review and the Corps of Engineers' studies on milfoil control are not yet available, the department has reviewed certain literature in order to make recommendations on herbicide use in Lake Washington this year.

Specific Comments on the Draft EIS

II. Summary

1. (Page 2, Paragraph 2) The last sentence states "Herbicides may persist in the water column or aqua-soil for a period to time". The Washington Department of Fisheries would be interested in the concentration of various herbicides in the water column over time.

2. (Page 2, Paragraph 3) This paragraph states herbicides will be applied at the "lowest effective rate possible" and that the applicator will be familiar with "the characteristics of water movement in the areas to be treated". It would be of assistance to reviewers of the Final EIS if these statements were defended by reference and diagrams showing the water current patterns, by area of proposed application.

III. Description of the Proposal

(Page 2, Paragraph 5 and Page 3, Paragraph 1) The proposed application to modify water quality standards by A-1 Spray Service, Inc. spans the period May through September, 1979. Does this mean the Laurelhurst (Union Bay) project could be conducted during the first two weeks of August when salmonid populations are relatively low as previously recommended by the Washington Department of Fisheries?

Areas Proposed for Treatment (Page 3)

1. Figures 1a and 1b showing general areas to be sprayed should be modified to define the exact boundaries. It would also be helpful if the maximum, minimum, and mean water depths were described, by area.

2. We also suggest including salmon migration routes and areas utilized by beach spawning sockeye salmon as shown on the attached copies of Figures 1a and 1b.

Materials Proposed for Use (Pages 3, 6, and 7)

Only a single page in this section was devoted to herbicide application

herbicides are given. We suggest reporting concentration of all herbicides and formulations in terms of active ingredients (i.e., 100% active ingredient).

2. Does the estimated water concentration of 2.5 ppm apply to both Aquathol and Aquathol K?

3. Aqua Kleen is proposed to be applied at 100 lbs/surface acre. Why is such a heavy dose being proposed? (See discussion in 4 below) What application rate is proposed for the other candidate herbicides?

4. What are the minimum levels of 2,4-D BEE (butoxyethanol ester) and endothal that are effective in controlling Eurasian milfoil? Schulz and Harman (1974) describe studies where concentrations of 2,4-D BEE between 4 and 112 lb/acre have been used. The British Columbia Ministry of the Environment, Water Investigations Branch has recently conducted Eurasian milfoil control experiments in Lake Okanogan using 2,4-D BEE concentrations between 10 and 40 lb/acre, with varying success.

5. If minimum levels of herbicide necessary to control milfoil effectively are used, what would be the instantaneous concentration of 100% active material in the water column? What are the estimated decay rates for the proposed herbicides (i.e., time to 50% reduction in water concentration) of the compounds and their metabolites (in the case of 2,4-D acid), and the corresponding concentrations of active material in the water column over time?

6. What is the meaning of the estimated water concentrations? In actuality, the granular materials are expected to sink to the bottom and leach. Even if the herbicide was wholly water soluble, very large concentration gradients would be expected (see paper by Wojtalik et al.) (1971) concerning behavior of 2,4-D DMA in a Tennessee Valley Authority reservoir).

7. The EIS does not indicate that application rates will be scaled to water depth. Hence, one can assume, that proportionately greater amounts of herbicide will be deposited in the shallower waters. The amount quoted in the EIS (e.g., 2.5 ppm) seems to be the theoretical average.

V. <u>Impact of the Proposal on the Environment and Measures to Mitigate Impacts Pages 14 and 15</u>.

1. There are some apparent contradictions which need clarification.

a. (Page 14, Paragraph 6) It is stated, "Limiting application to the levels specified on the label should avoid toxic effects to aquatic life (we assume salmonids) other than milfoil."

c. (Page 14, Paragraph 2) "Our review of the literature indicates a wide variability of toxicity to aquatic organisms with effects to juvenile salmonids reported at concentrations lower than 1 ppm."

2. Different formulations of 2,4-D and endothal possess different toxicities to aquatic organisms, and this variation will become much greater if toxic concentrations are not expressed in terms of 100% active ingredient. This must be done for all cited toxic levels which may help clarify comment 1 above.

3. The review of the literature concerning toxicity to fish and invertebrates seems not to reflect the state of our knowledge and needs work. Surprising was the emphasis in the citations of toxicity levels for exposures of 24 and 48 hours, given that a 96-hour exposure period is the standard. The reliance upon Duke)1976), which emphasized estuarine organisms even though freshwater forms were annotated, may be inappropriate. The authors of the EIS should consult Schultz and Harman (1976) for a comprehensive literature review. They should also consult Folmar (1977) Woodward and Mayer (1978), Lorz et al. (1979), and Meehan et al. (1974).

4. It is stated that fish have been observed to avoid low concentrations of 2,4-D in water. Where is the documentation for this statement?

5. The authors state that little information is available concerning the effects of endothal on fish. Folmar (1977) lists several excellent references.

IX. Bibliography (Page 22) and References (Page 20)

We suggest including the following publications which have been used for our review and recommendations:

Folmar, L.C. 1977. Acrolein, dalapon, dichlobenil, diquat, and endothal: bibliography of toxicity to aquatic organisms. Technical Papers of the U.S. Fish and Wildlife Service. No. 88. 15pp.

Lorz, H.W., S. Glen, R.H. Williams, C.M. Kunkel, L.A. Norris, and B.R. Loper, 1979. Effects of selected herbicides on smolting of coho salmon. Environmental Protection Agency, Corvallis Environmental Res. Lab. (In Press).

Meehan, W.R., L.R. Norris, and H.S. Sears. 1974. Toxicity of various formulations of 2,4-D to salmonids in southeast Alaska. J. Fish. Res. Board Can. 31:480-485.

Schults, D.P. and P.D. Harman. 1974. A review of the literature on the use of 2,4-D in fisheries. Bureau of Sport Fisheries and Wildlife, Report No. PB-235-457. Available through N.T.I.S.

Wojtalik, T.A., T.F. Hall, and L.G. Hill. 1971. Monitoring ecological conditions associated with wide-scale applications of DMA 2,4-D to aquatic environments. Pest. Monitoring J. 4: 184-203

Woodward, D.F. and F.L. Mayer, Jr. 1978. Toxicity of three herbicides (butyl, isoctyl, and propylene glycol butyl ether esters of 2, 4-D) to cutthroat trout and lake trout. Technical Papers of the U.S. Fish and Wildlife Service. No. 97. 6pp.

Recommendations

The Department of Fisheries, acutely aware of the milfoil problem, met internally in March, 1979 to outline a program which would evaluate herbicide application while still being protective to salmon in or adjacent to a herbicide treatment area. The following three steps were proposed:

1. Utilize the readily available literature to determine a reasonably safe concentration to salmon of a known, milfoil effective herbicide (2,4-D BEE) in the water column.

2. Recommend a spray project in the absence of large numbers of salmon to be monitored by a water quality agency to determine the actual concentrations of 2,4-D BEE (mg/l) throughout the water column following a fixed rate of herbicide application (lbs/acre).

3. Compare the results of the spray project and the literature review to determine if 2,4-D BEE could be safely used close to areas of heavy salmon usage such as adjacent to Union Bay.

Our literature review concluded that the concentrations of 2,4-D BEE, following a single application only, should not exceed 0.1 mg/l (as measured for the ester and not free 2,4-D acid) anywhere in the water column where significant numbers of salmon may be present. For multiple applications, the ester concentration should not exceed 0.031 mg/l. (Woodard, D.F. and F.L. Mayer, Jr. 1978)

Therefore, the Washington Department of Fisheries recommends the following for the protection of resources under its jurisdiction only (RCW 75.04.040):

1. Conduct a spray application of 2,4-D at all or any of the listed areas in the Draft EIS except Laurelhurst (Union Bay), anytime after June 15, 1979, when the sockeye fry have emerged from spawning gravels in or closely adjacent to the treatment area. The rate of application (lbs/acre) should be set at the minimum necessary to accomplish desired milfoil control and not necessarily the doses requested by the applicant.

2. Arrange for a competent water sampling program similar to that considered by METRO in December 1977, to determine the concentration of 2,4-D BEE (Ester) throughout the water column, in and outside the treatment area to compare with the reasonably safe levels for salmon described above.

3. Treat the Laurelhurst area only after the results from above are obtained or postpone until the first two weeks of August. This recommendation applies only to herbicide use and salmon resources. We understand considerable work involving physical control measures is planned within the area this coming milfoil season. The involved agencies should be consulted regarding herbicide use to determine compatibility with their program. Such non-chemical methods could be used any time of year at this location without impacts to salmon if properly conducted.

These recommendations apply only to the fisheries resources under the jurisdiction of the Department of Fisheries. Thank you for the opportunity to comment and we hope our recommendations will be of value to all concerned with milfoil control.

Sincerely,

William Rest

Gordon Sandison
Director

mr

cc: Mr. Bob Matsuda, METRO
Mr. Bob Rawson, Seattle COE

appendix e

LETTERS OF COMMENT ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT

Dear Mr Rawson and others involved—

I heartily oppose the treatment of the Eurasian milfoil with 2,4-D or any other defoliant. First of all, I cannot believe it presents little or no danger to humans. Anything that can have my entire garden laying on the ground within hours, from only the "drift" left over from the spraying of a nearby wheat-field is very potent stuff and I can't believe it doesnt effect me. Right after that spraying I had a miscarriage (I am not an easy risk for miscarriage). I believe it was 2,4-D.
Second the effect it would have on the environment thru disrupting the balance of nature is devastating! 2,4-D kills all plants that are "broadleafs" (not members

of the grass family). If you know anything of how a food chain works you know it would effect every-one & everything rather significantly.
I believe mechanical is the only sane alternative.
As for the disposal problem - there are many alternatives. To name a couple: #1. compost it and put it in our depleted & deficient (of minerals, organic loam & much more) fields. #2 In view of the gas problem the rotting milfoil is an excellent source of methane or material for alcohol production. There are many alternatives.
Please don't poison our world anymore!

Very sincerely,

Debbie Powell

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

PEP ER 79/696

JUL 23 1979

Lt. Colonel Maxey B. Carpenter, Jr.
Acting District Engineer
Seattle District, Corps of Engineers
Department of the Army
Post Office Box C-3755
Seattle, Washington 98124

Dear Colonel Carpenter:

This is to inform you that we have just received sufficient copies of your draft environmental statement entitled "Aquatic Plant Management Program - State of Washington" in order to conduct our Departmental review. The Department will have comments but will be unable to reply within the allotted time.

Therefore, we are requesting a time extension until September 14, 1979.

Sincerely,

Bruce Blanchard
Director

Office of the Engineer

OKANOGAN, WASHINGTON 98840

OKANOGAN COUNTY

ALAN O. KING
COUNTY ROAD ENGINEER
POST OFFICE BOX 232
PHONE AC 509/422-3350

July 23, 1979

Department of the Army
Seattle District
Corp of Engineers
P.O. Box C-3755
Seattle, WA 98104

Re: Aquatic Plant Management Program,
State of Washington
Environmental Impact Statement Draft

Attn: Maxey B. Carpenter, Jr.
Acting District Engineer

Dear Mr. Carpenter:

The Okanogan County Department of Public Works supports the proposed action as defined in the Draft Environmental Impact Statement. It would appear that a combination of chemical and physical control measures based on our current experience would be the most cost effective and environmently acceptable methods available.

We are greatly concerned about the spread of Milfoil in the Okanogan River system for many reasons and feel that a program of this type is a necessity, however, Okanogan County, acting on its own volition, does not have the resources due to the scope of the existing problem and the potential impacts of the problem expanding.

Thank you for the opportunity to comment on this action.

Sincerely yours,

Alan O. King

Alan O. King, P.E.
Director of Public Works

AOK/ls

cc: County Commissioners

STATE OF WASHINGTON
Dixy Lee Ray
Governor

WASHINGTON STATE PARKS AND RECREATION COMMISSION
7150 Cleanwater Lane, Olympia, Washington 98504
206/753-5755

July 25, 1979

Maxey B. Carpenter
Lt. Colonel, Corps of Engineers
Acting District Engineer
Seattle District
P.O. Box C-3755
Seattle, WA 98124

Re: AQUATIC PLANT MANAGEMENT PROGRAM

Dear Mr. Carpenter:

The staff of the Washington State Parks and Recreation Commission has reviewed the Draft EIS titled *Aquatic Plant Management Program, State of Washington* and has the following comments:

Page 59, Paragraph 4.15: Impacts on Recreation Control of milfoil in recreation areas will be extremely beneficial particularly for swimming, boat launching and water skiing. Heavy milfoil infestations can curb or eliminate these types of aquatic recreation pursuits. The short time restriction on recreation use required for herbicide treatment of milfoil presents no problem for State Park management since the alternative of no treatment may well result in a permanent restriction on recreational use.

Page 13-35, Paragraph 5 and 6: Letter from US Fish and Wildlife Service
It is stated that "All agency representatives were reluctant to estimate potential losses to fish, habitat or related recreation..." The agencies "represented" included the Washington Department of Fisheries and Game, and the National Marine Fisheries Service. None of these agencies are recreation management agencies. Therefore, it seems unusual for them to have expertise in recreation matters. Perhaps it would be useful for each agency to report on its area of expertise. State Parks has in the past and is again willing to state that heavy infestations of water milfoil will necessitate closing recreation facilities such as swimming beaches, boat launch ramps and water ski areas. For example, the swim area at Steamboat Rock State Park (Bank Lake) was opened only after proper milfoil removal was effected in the spring of 1979.

The second to the last paragraph of page 13-35 states that current fish, habitat, and recreational losses caused by milfoil infestations and the anticipated effects of the limited existing proposal are limited. This remarkable statement seems to ignore totally the preventative aspects of the milfoil program being proposed. Since milfoil is now in the "explosive growth" state (page 6 of subject EIS), now is the time to effect control while the infestation is still

small. If growth is allowed to continue unchecked, the areas to be treated will be much larger as will the magnitude of the recreation losses.

I hope these comments are of assistance in your endeavor to present the full range of environmental impacts inherent in this needed proposal.

Sincerely

Dave Heiser

Dave Heiser, Chief
Environmental Coordination

bf

cc: John B. Pinkerton, Washington State Parks and Recreation Commission
Washington State Department of Fisheries
Washington State Department of Game
United States Fish and Wildlife Service (Olympia)

Mike McPhail
4905 Woodl[illegible]nd Pk Ave N
Seattle, Wa 98103

July 27, 1979

Robe[illegible] [illegible]wson or [illegible]
Se[illegible] [illegible]ict
[illegible]
P.O. [illegible]
[illegible]

[illegible]

I [illegible] Plant Management Program Draft EIS and would greatly appreciate the following details :

1. The definition of "navigable waters" (as defined in Corps regulations). This is referred to in paragraph 1.05, page 15 ;

2. A copy of the Design Memorandum. This is referred to in paragraph 1.05.4, page 29.

An expeditious response is requested considering the public comment period closes August 31. Thank you.

Sincerely,

Mike McPhail

Mike McPhail

METRO
Municipality of Metropolitan Seattle

Exchange Bldg. • 821 Second Ave., Seattle, Washington 98104

August 3, 1979

Maxby B. Carpenter, Jr.
Lt. Colonel, Corps of Engineers
Seattle District, COE
P. O. Box C-3755
Seattle, Washington 98124

Dear Col. Carpenter:

Draft Environmental Impact Statement
Aquatic Plant Management Program (July 1979)

Metro staff has reviewed the draft EIS for the proposed Aquatic Plant Management Program, and we do not anticipate adverse impacts to our wastewater facilities or public transportation system as a result of this proposal. However, as the 208 Areawide Water Quality Planning Agency for the Cedar-Green River Basin and as the lead agency in the Union Bay Research Demonstration Program, we have several comments and concerns regarding the proposal.

We appreciate the opportunity to review and comment on the COE's proposed Aquatic Plant Management Program. As noted in the DEIS, the concept of and need for such a management program was identified by Metro and DOE in 1977. We are pleased that COE is developing such a program which appears to allow for local selection of control methodologies and which provides a funding mechanism by which the program can be implemented. The program framework appears to be consistent with the Metropolitan Council Water Quality Committee's current policy of discouraging the use of herbicides in Lake Washington for the control of Eurasian water milfoil until more is known about the long-term effects of such applications.

The DEIS frequently refers the reader to the Design Memorandum for more detailed and specific data or explanations concerning major elements of the proposed control program and its impacts. The Design Memorandum is not included with the DEIS and it is our understanding from discussions with COE staff that it will not be available for public review prior to the end of the public review period on the Draft EIS. However, review of the Design Memorandum is necessary to more clearly understand such elements of the program as the basis for the cost/benefit analysis, the process proposed for selection of control methodologies, the criteria proposed for selection of control areas and the proposed system for prioritization and funding of site-specific control programs in subsequent years.

As the COE is aware, Metro is a co-sponsor along with the DOE, University of Washington, City of Seattle and King County, for the Union Bay Research Demonstration Program which is investigating alternative treatment methodologies for the control of milfoil in Union Bay. Included in the research program are mechanical harvesting and use of the bottom cover "Aquascreen," as well as a scientific literature review survey for not only 2,4-D, as stated in your DEIS, but will also include endothal (dipotassium salt), casoron and diquat. One of the goals of the Union Bay Milfoil Demonstration Project is to identify costs associated with harvesting and bottom covers in Union Bay. This information should be available in October and can be provided to you to assist in your cost analysis. The primary use of this information will be by local agencies in selecting control methodologies to be financially supported by your program.

According to the DEIS, local agencies would propose specific sites and methodologies for control of milfoil and submit those programs to the Department of Ecology. An attachment is provided with this letter which outlines the decision-making strategy and time frames for the completion of the Union Bay Demonstration Study, including selection of a local sponsoring agency and control methodology for Union Bay of Lake Washington. According to this draft schedule, submittal to DOE for funding under the COE program could occur by January 1980, and we anticipate this would allow sufficient time for consideration of the submittal by both DOE and COE.

Thank you for the opportunity to comment on this draft document. We anticipate being able to make more specific comments on the program upon receipt of the Design Memorandum. Please call me at 447-6619 if you have any questions concerning our comments.

Very truly yours,

Rodney G. Proctor

Rodney G. Proctor, Manager
Environmental Planning Division

RGP:vbm
Attachment
cc: Robert Matsuda
Union Bay Technical
Review Committee members

ATTACHMENT

DRAFT

UNION BAY DEMONSTRATION PROJECT
DECISION-MAKING STRATEGY & TIME FRAMES
(for the period July 1979-April 1980)

	TASK	TARGET DATE
1.	Corps of Engineers released draft EIS for statewide control program.	July 17
2.	Results of herbicide literature study available.	
	- Medical	August
	- Aquatic environment	August
3.	Comments due back to Corps.	August 31
4.	Second harvest of Union Bay Study.	Early Sept.
5.	Identify relationships between management/ financial alternatives and control techniques.	Sept. 15
6.	Receive final assessment of alternative control techniques.	Oct. 1
7.	Submit analysis of alternatives to Water Quality Committee on local sponsoring agency and control methodology.	Oct. 31
8.	Water Quality Committee recommendation.	Nov. 29
9.	Metro Council considers recommendation.	Dec. 6
10.	Metro Council decision.	Dec. 31
11.	Local agency accepts lead role (will need to go through SEPA).	Jan. 1, 1980
12.	Lead agency applies for Corps funds.	January 1980
13.	Lead agency may contract for or buy any equipment, supplies, services that will be needed.	
14.	Lead agency starts any permit processes necessary.	February 1980
15.	Local agency action on milfoil.	April 1980

SS:shm
8/3/79

Advisory Council On Historic Preservation

1522 K Street N.W.
Washington D.C.
20005

**Reply to: P. O. Box 25085
Denver, Colorado 80225**

August 6, 1979

Lt. Colonel Maxey B. Carpenter, Jr.
Acting District Engineer
Corps of Engineers, Seattle District
Department of the Army
P. O. Box C-3755
Seattle, Washington 98124

Dear Lt. Colonel Carpenter:

This is to acknowledge receipt of the draft environmental statement for the "Aquatic Plant Management Program-State of Washington," on July 27, 1979. We regret that we will be unable to review and comment on this document in a timely manner pursuant to Section 102(2)(C) of the National Environmental Policy Act of 1969.

Nevertheless, the Corps of Engineers is reminded that, if the proposed undertaking will affect properties included in or eligible for inclusion in the National Register of Historic Places, it is required by Section 106 of the National Historic Preservation Act of 1966 (16 U.S.C. Sec. 470f, as amended, 90 Stat. 1320) to afford the Council an opportunity to comment on the undertaking prior to the approval of the expenditure of any Federal funds or prior to the issuance of any license. The Council's regulations, "Protection of Historic and Cultural Properties" (36 CFR Part 800.4) detail the steps an agency is to follow in requesting Council comment.

Generally, the Council considers environmental evaluations to be adequate when they contain evidence of compliance with Section 106 of the National Historic Preservation Act, as amended. The environmental documentation must demonstrate that either of the following conditions exists:

1. No properties included in or that may be eligible for inclusion in the National Register are located within the area of environmental impact, and the undertaking will not affect any such property. In making this determination, the Council requires:

--evidence that the agency has consulted the latest edition of the National Register (Federal Register, February 6, 1979, and its monthly supplements);

--evidence of an effort to ensure the identification of properties eligible for inclusion in the National Register, including evidence of contact with the State Historic Preservation Officer, whose comments should be included in the final environmental statement.

2. Properties included in or that may be eligible for inclusion in the National Register are located within the area of environmental impact, and the undertaking will or will not affect any such property. In cases where there will be an effect, the final environmental statement should contain evidence of compliance with Section 106 of the National Historic Preservation Act through the Council's regulations, "Protection of Historic and Cultural Properties".

Should you have any questions, please call Jane King at (303) 234-4946, an FTS number.

Sincerely,

Louis S. Wall
Chief, Western Division
of Project Review

CITY OF KIRKLAND
210 MAIN STREET · KIRKLAND, WASHINGTON 98033 (206) 822-9271

August 9, 1979

Mr. Robert Tawson
Seattle District
U. S. Army Corps of Engineers
4735 E. Marginal Way South
Seattle, Washington 98134

Dear Mr. Tawson:

Regarding the U. S. Army Corps of Engineers Draft EIS Aquatic Plant Management Program. The City of Kirkland is experiencing difficulties with milfoil infestation in heavily used swimming beach areas, specifically at Houghton Beach and Waverly Park. We request your consideration for inclusion of the former in the Yarrow Bay treatment proposal.

Further infestation of milfoil could have a detrimental effect in Kirkland on recreational and navigational useages as well as causing a significant loss in value of adjacent shoreland and upland values. We endorse your efforts to solve the problem.

Please direct any inquiries to David Brink, Director of Parks and Recreation, 822-9271.

Sincerely,

Allen B. Locke

Allen B. Locke
City Manager
CITY OF KIRKLAND

ABL:bb

P.O. Box 40
Kaktovik, Alaska 99747
10 August 1979

Lt. Col. Maxey B. Carpenter, Jr.
Acting District Engineer, Seattle District
U.S. Army Corps of Engineers
P.O. Box C-3755
Seattle, Washington 98124

Dear Lt. Col. Carpenter:

I have just recently received one copy of your office's draft environmental impact statement (EIS) for an "Aquatic Plant Management Program" for the state of Washington, enclosed with your cover letter of 16 July 1979. Your cover letter indicates that comments are requested for inclusion in the final EIS. This letter constitutes my comments on the draft EIS as a private citizen. Due to the refusal of your office to provide access to the draft EIS and/or earlier versions of the draft EIS when requested in June 1979 and subsequent time and location constraints on my part, these comments will be fairly general in nature and, for the most part, will not include specific reference citations. However, a sample of citations was included with the comments which I wrote for Friends of the Earth regarding the draft EIS of the Washington Department of Ecology for watermilfoil control in Lake Washington circa 18 April 1979. Your office has a copy of those comments and it is requested that they be attached to this letter as a part of my comments on this draft EIS.

In general, the draft EIS is inadequate as a document from which to make an informed decision regarding the topic matter. Important relevant information is not included in the draft EIS and some of the information which is included is presented in such a way that it is evident that prejudgement has biased the writing (either conciously or unconciously) in the direction of favoring previously stated Corps policy.

Comments keyed to identified page numbers are as follows (due to the format of the draft EIS there is some degree of overlap in comments as certain topics are discussed on more than one page or in more than one section):

1. Title page - The names of the authors and their qualifications are missing. They should be included so that the authors may be held professionally accountable for the quality (or lack of quality) of their work.

2. Page 1 - The summary of adverse environmental effects fails to include the degradation of water quality associated with chemical control due to the introduction of the chemical itself (i.e., herbicides are toxic substances whose introduction is a violation of water quality standards regardless of secondary effects such as the lowering of dissolved oxygen levels during biomass decomposition). Although noise and air quality effects are listed as adverse consequences of mechanical control methods, the similar adverse effects that would accompany increased power boat usage projected as a project result are not mentioned. They should be. Increased power boat usage also means increased pollution due to the accompanying waste and pollutant discharges and increased energy consumption for non-essential (i.e., recreational) purposes during a time of national energy shortages. All control methods would, to some degree, require irretrievable committment of petroleum resources. This would be another adverse effect. No comparable figures are given in the draft EIS; however, the use of chemicals requires consumption of such resources in both manufacture and application whereas mechanical control utilizes them only in treatment (in terms of continuing committment).

3. Page 1 - The alternatives evaluated purportedly included other chemicals such as "silvex". It is suggested that confusion could be avoided and it would be more technically correct if all chemicals were referred to by their chemical names rather than trade names (unless a specific product is being endorsed). Furthermore, 2,4,5-TP was suspended for such uses by emergency order of the U.S. Environmental Protection Agency (EPA) late this winter as an "imminent hazard" to human health.

4. Page 1 - The word "infested" is utilized to describe the occurrence of Eurasian watermilfoil growth. This is a value laden word that is inappropriate for use in a technical document unless bias is intended.

5. Page 1 - Reference is made to Reed (1977) that Eurasian watermilfoil may form "extensive mats on the water surface". Whereas this may or may not occur in other areas and it is certainly less likely to occur in an area where water level fluctuations are minor, it is somewhat misleading to include such a statement without indicating whether or not such a phenomena occurs in the state of Washington. Biologists have noted a lack of such mats in the Seattle area.

6. Pages 1 and 2 - It is stated that M. exalbescens differs "significantly" from M. spicatum yet it is also stated that the "similarity" between the two has resulted in taxonomic confusion. The draft EIS fails to specifically identify what, if any, important differences there are between the two in terms of the need for control measures for one but not for the other.

6. Page 2 - It is stated that the spread of Eurasian watermilfoil "is thought" to have been aided by "the aquarium trade" and by "waterfowl movement". Both of these methods of spread are indicative of beneficial aspects of Eurasian watermilfoil (i.e., the esthetic beauty of the plant that makes it attractive to aquarium owners and its value as food for waterfowl). These benefits of the plant should be credited in the draft EIS and considered in relevant decision making. The word "infestation" is used again (see comment number 4 above). It would appear to be likely that Eurasian watermilfoil occurred in the Seattle area (and possible elsewhere in Washington) considerably prior to the 1974 date indicated in the draft EIS. Watermilfoil-like plants were noted in Lake Washington in the 1930's and Eurasian watermilfoil is known to have occurred in British Columbia prior to that time. Furthermore, the level of plant occurrence in Union Bay was high enough by 1975 to generate significant complaints from recreational boaters. It is unlikely that such a level of growth occurred in less than one year. Watermilfoil is widely distributed in northwest states and has been for some time. Due to the taxonomic confusion, it cannot be definitively stated whether or not the watermilfoil seen in past accounts is M. exalbescens or M. spicatum. Watermilfoil has been found in a number of areas besides those indicated on Figures 1, 2, and 3 in the state of Washington. Failure to acknowledge such occurrence may give rise to an artificially created impression of rapid expansion of occurrence which is merely the result of looking for something not looked for before.

7. Pages 2 and 6 - In the discussion of the introduction of non-native species it is indicated that "The period of absorption... may take hundreds of years". No mention is made of the apparent rise, peak, and decline cycle that has occurred in other parts of the United States and Canada in significantly less than 10 years or the evidence of decline in the Seattle area documented in Municipality of Metropolitan Seattle (Metro) reports. Furthermore, no mention is made of the potential for spread (either in this section or following sections) that would allow evaluation quantitatively for the Seattle area. If the potential is low, as it may be, and if a natural

ecolibrium has already been reached (assuming non-native introduction), as it may be, is any control program intervention necessary?

8. Page 6 - Grazing by snails in British Columbia is mentioned by reference to an unpublished Ministry of the Environment document (Kangasniemi, 1978). However, the significance of such grazing as a control method applicable to Washington is not dealt with in the draft EIS. Why not? A copy of the Kangasniemi memorandum is hereby requested in accordance with the provisions of the Freedom of Information Act (as amended).

9. Page 6 - Mention is made of watermilfoil related problems in the Tennessee Valley system. How relevant are such problems to the somewhat different environmental conditions of Washington and what other control measures are available that might adequately deal with the problems short of the proposed control program (such as screening of water intakes, etc.)? Similarly, are the comments in the draft EIS regarding sedimentation and water temperature increases in Tennessee relevant to the situation in Washington?

10. Page 7 - In addition to the beneficial aspects of aquatic vegetation listed on page 2 that would apply to Eurasian watermilfoil, the draft EIS notes correctly on page 7 that Eurasian watermilfoil is "an important food source for some species of overwintering waterfowl" and that "one clear value of milfoil growth... is that it enhances sport fishing". These are important benefits.

11. Page 8 - It is acknowledged on page 8 that "most of the literature dealing with" factors affecting Eurasian watermilfoil growth "are from other parts of the country". In fact, much of it is from warm water areas and applicability to colder northwest waters is uncertain. A general fault of the draft EIS is the almost total lack of data specific to the proposed project areas in Washington. The discussion of environmental factors on pages 8, 9, 10, and 11 mentions conditions in Tennessee and elsewhere but fails to mention how such factors in, for example, the Seattle area might affect Eurasian watermilfoil occurrence and growth. What about Seattle's famous rainfall (it is noted here that Eurasian watermilfoil problems in the Seattle area became a public controversy during a period of local drought)? How might this affect growth? If the optimum Eurasian watermilfoil photosynthesis temperature is 35 °C what does this mean for Lake Washington where water temperatures are substantially less year round and only exceed 18 °C in the warmest part of the summer. What are the pH, alkalinity, and salinity conditions in areas of Washington that treatment is proposed for and what affect might these parameters have?

12. Page 11 - What is the basis for the estimate of possible acreage that might be impacted by Eurasian watermilfoil in the event of spread in the Columbia River system? Why is no information given regarding the Seattle area as mentioned in comment number 7 above already?

13. Page 11 - It is stated that harvesting might increase the spread of Eurasian watermilfoil by fragmentation. Is spread a problem of concern in the Seattle area where occurrence is already wide in the interconnected system including Lake Washington by natural fragmentation? A number of biologists have stated that natural fragmention exceeds whatever fragmentation may occur by harvesting operations. If so, this purported drawback of harvesting would seem to be inconsequential.

14. Page 11 - Old data is quoted (i.e., 1965) regarding the <u>economic</u> feasibility of use of harvested Eurasian watermilfoil after composting as fertilizer. How feasible

is composting for fertiliser today? The draft EIS fails to answer this question; however, other researchers have found composted Eurasian watermilfoil to be useful as a soil additive and as biomass for energy conversion.

15. Page 12 - As indicated on page 12, hand removal "can be used to clear around private piers" and in fact that has been done successfully by Lake Washington shoreline residents with a minor expenditure of personal time. The bulk of the complaints from recreational boaters and shoreline property owners might, in fact, be adequately resolved by such a method if such people were willing to spend a little time and energy of their own solving their problems rather than demanding that government do it for them. Furthermore, the exercise would be a healthy side benefit.

16. Page 13 - The discussion of chemical control is facile and fails to indicate either the probable efficacy or the public health and environmental risks of the intorduction of such toxic substances into water. Discussion later in the draft EIS is similarly inadequate. For example, whereas 2,4-D might result in some kill of root systems, the expected kill in open water systems is significantly less than 100 percent and grow back could be expected relatively rapidly. What is the Corps' definition of "complete control" ? With regard to all of these chemicals, but 2,4-D in particular, it is mentioned that restrictions might apply with regard to "domestic or irrigation water intakes and in salmon spawning and fry rearing areas". In fact, pending a definitive interpretation of label restrictions by the EPA, it would appear that the use of 2,4-D in the vicinity of irrigation water intakes would be illegal. Regardless of legality, public health and environmental concerns are of critical importance and would mitigate against the use of toxic chemicals.

17. Page 14 - It is indicated on page 14 that mechanical harvesting "causes a spurt of growth". Possibly, however, research in other locations has demonstrated that repeated mechanical harvesting leads to reduced grow in following years. The reduced growth is not mentioned.

18. Page 14 - It is indicated that aerial surveillance would be used to monitor the spread of Eurasian watermilfoil. Precisely how would this be done and has any such surveillance been done to date? If so, what were the results? If not, why not?

19. Page 15 - It is correctly noted on page 15 that eradication programs have been unsuccessful elsewhere and therefore "would not be attempted here".

20. Pages 16 through 28 - The discussion of the proposed control program for the Seattle area lacks critical site specific information. Neither are references given for the information which is presented. What is the basis for the information presented in Figures 4 through 12? Is this one year's worth of data or more? Does the occurrence indicate conditions for 1979? Are there density differences and, if so, what are they? The bulk (almost the entire) of the areas involved would appear to boat lanes for the benefit of private residences or private yacht clubs rather than the public as a whole. Waverly Park is not identified in the written text or on a figure. No figure is included for Lake Sammamish. For Seward, Madrona, and Pritchard Parks no mention is made of the on-going city of Seattle program using bottom screens. Neither are those parks identified on a figure. Is Eurasian watermilfoil in fact present at them (or all other sites listed in the draft EIS)? Surveys conducted in the winter and spring of 1979 failed to detect the presence of that plant, although water lillies were noted to be present at Seward. Similarly for Lake Sammamish, a survey in the spring of 1979 failed to find any problem resulting from the presence of Eurasian watermilfoil. Growths of that plant were not obstructing

either swimming or boat ramp areas. In fact, the near absence of the presence of Eurasian watermilfoil, despite earlier assertions to the contrary by the state agency in charge of the park, forced Metro to relocate its planned mechanical harvesting demonstration effort from that area to another.

21. Pages 28 and 29 - The purported "benefit/cost analysis" presented in the draft EIS presents a completely unsupported assertion rather than an analysis. Neither benefits nor costs are quantified in any detail and no information to support the figures presented is given. On the surface the figures given and the ratio listed are ludicrous. According to the draft EIS some discussion of the methodology is presented in a "Design Memorandum" prepared by your office. If so, that document should have been appended to the draft EIS. A copy of it is hereby requested in accordance with the provisions of the Freedom of Information Act (as amended). On page i of the draft EIS it is indicated that the control program proposed would be for an area totaling 91 acres. Adding up the individual figures for the identified areas from the text (excluding Waverly Park which is not identified) a total of 86 acres is identified as a maximum (Lake Sammamish State Park is identified as being less than 2 acres). According to the draft EIS, the benefits are calculated as "the cost of the most likely, least cost alternative that land owners would invest in, in the absence of a Federal program". Presumably, the benefits are given as an annual figure so that they would be comparable to the annual cost of the program. How then were benefits of $55,100 arrived at for the Madrona, Seward, and Pritchard Parks areas, for example. These areas are identified as totalling 2 acres. Assuming a cost of $6,000 per acre for bottom screening, the total cost would be $12,000 and that cost would be prorated over the estimated 10 year plus life of the material (i.e., a crude estimate of $1,200 per year). The high benefits are identified for the public beaches and the clearing of boat lanes for shoreline residents and yacht clubs is pegged at $300 per acre (the approximate figure for one herbicide treatment or two or more mechanical harvestings). For further example, how were benefits of $747,500 arrived at for control of less than 2 acres at Lake Sammamish State Park which don't even need to be controlled? What control alternative costs in excess of $373,750 per acre? Using the figures in the draft EIS and assuming the high number of 91 acres (which includes unidentified acreage) the draft EIS indicates benefits of $10,215 per acre. What alternative costs that much per year? Using the figures in the draft EIS for proposed project costs ($144,000) the per acre figure would be $1,582 (over an order of magnitude more expensive than estimated costs for one mechanical harvesting treatment. Costs for the proposed project seem to be grossly inflated, although not nearly as inflated as assumed benefits.

22. Page 30 - Similar comments would seem to be pertinent with respect to the "benefit/cost analysis" of the proposed prevention program. No information to support the numbers presented in the draft EIS is given. Figures are merely listed.

23. Page 31 - Although it is stated on page 31 that site specific conditions would be important in the selection of the appropriate chemical formulation, no such information is presented in the draft EIS and no discussion is presented to indicate how such considerations might enter in to such decision making other than a notation with regard to granular formulations. Timing considerations with regard to salmon area is also mentioned; however, no information regarding these areas or the nature of proposed timing considerations is given in the draft EIS.

24. Page 38 - It is stated in the draft EIS that the lakes for which treatment is proposed in the Seattle area "have important fish and wildlife areas", including "several ecologically important marshes". However, these are not identified in the draft EIS nor are measures which would be taken to protect them listed. If chemicals

were to be utilized, for example, how would these areas be protected from the extensive drift that is known to accompany herbicide use including the use of granular formulations?

25. Pagees 39 and 40 - Under the heading of "water quality", a very general discussion is given which fails to present any relevant information concerning important water quality parameters.

26. Page 40 - The discussion regarding Lake Sammaish State Park in comment number 20 above applies here with regard to the presence of Eurasian watermilfoil.

27. Page 41 - It is noted on page 41 that "many private property owners... pump small amounts of water (from the Seattle area lakes) for irrigating law(n)s and gardens". Such utilization of those waters would appear to preclude the use of chemical control methods.

28. Page 41 - It is acknowledged in the draft EIS that "Marsh areas are very important to the ecology" of the various Seattle area lakes and that "Care must be taken in the selection of control methods to insure that the fish and wildlife values at sensitive sites are protected". However, no information is presented in the draft EIS as to how such protection might be accomplished for various control measures.

29. Page 43 - The acknowledgement in the draft EIS that the Okanogan Valley "is a critical deer-wintering ground and is an important area for waterfowl" and other species would seem to indicate that great care should be taken to protect those resources from the risk of adverse effects resulting from chemical control methods (i.e., the introduction of toxic substances into the water system).

30. Page 45 - As with comment number 29 above (and for other similar comments for the Seattle area), no information is presented in the draft EIS as to how the important natural resources mentioned would be protected in the event the proposed program is implemented.

31. Page 46 - Local government agencies indicated this spring in the Seattle area that "substantial development permits" would be required for the use of chemical control methods under the Shoreline Management Act. This is most appropriate in that one of the purposes of that act was to protect environmental quality.

32. Page 47 - Other than a cursory note of its existence, the draft EIS fails to present any relevant information with regard to aquatic plant control studies being carried out by Metro in coordination with other agencies. Such information is critically relevant to the proposed program and should not be ignored. Why hasn't the Corps coordinated directly with Metro? As a member of the Metro Technical Committee advising Metro with regard to the conduct of their study, the absence of interest by the Corps has been striking.

33. Page 47 - Mention is made of the Washington Department of Ecology's (DOE) EIS for chemical control methods in Lake Washington. As per my comments on that document (mentioned in paragraph one of this letter and incorporated into these comments by that reference) and in the considered opinion of the one member of the Washington Polluction Control Hearings Board who, of three, considered the merits of the substantive issues of the case, that EIS was totally inadequate and biassed. The use of the words "opponents of chemical treatment" to characterize those persons/groups who appealed the inappropriate issuance of the permit by the DOE to allow

chemical treatment would seem to indicate a value position by the authors of this draft EIS. Whether or not a person was opposed to the use of chemicals the inappropriate nature of the DOE decision left considerable room for opposition on other grounds.

34. Page 48 - Although "minor" adverse impacts of "short duration" are identified for mechanical harvesting, similar impacts which would be caused by chemical treatment are downplayed.

35. Pages 50 and 51 - Although it is correctly noted on page 50 that mechanical harvesting "should cause no significant adverse effects on water quality" little is said about the adverse effects of chemical control methods on water quality on page 51 other than to note that they "are possible". Again, the drift problem is mentioned but no site specific information is given so that the proposed project can be evaluated. With regard to chemical persistence, the draft EIS makes only general statements (although it is acknowledged that long persistence could occur in the sediments).

36. Page 52 - It is noted on page 52 that studies have shown that "repeated harvesting will eventually decrease the need for harvesting" (i.e., harvesting has a beneficial control carry-over effect. This information is relevant to comment number 17 and should have been mentioned on page 14 of the draft EIS.

37. Page 53 - Comments 16 and 27 above apply here also with regard to irrigation intakes. The draft EIS proposes to "minimize" the problem of "unwanted plant kills" by "management techniques and public notification". A better method would be to follow the label instructions prohibiting introduction of 2,4-D into irrigation waters. Then the problem could be entirely avoided rather than minimized.

38. Page 53 - It is indicated that the selectivity of 2,4-D will result only in kill of Eurasian watermilfoil and stargrass. This may or may not be; however, if it is so, how will this be "beneficial" with regard to other nontarget species? If nontarget species take over where Eurasian watermilfoil and stargrass were growing the net result is merely a change of species of aquatic plant present with the species other than Eurasian watermilfoil still able to cause similar impacts with regard to recreational boaters. It is the Corps' position, as implied here, that 2,4-D will not kill _M. exalbescens_?

39. Page 56 - It is acknowledged on page 56 of the draft EIS that the "edge effect" of mechanical harvesting may be beneficial with regard to game fish (as is the mere presence of Eurasian watermilfoil itself as was noted in comment number 10 above).

40. Pages 56 and 57 and appropriate sections of Appendix A including Table 2 - The draft EIS purports to present a discussion of the impacts of chemical control on fish. That discussion is seriously deficient. Furthermore, other components of the complete aquatic ecosystem (such as benthic and planktonic organisms which serve vital functions in the system) are ignored in the main text of the draft EIS and given only cursory mention in Appendix A. Again, none of the data is specific to native northwest species identified in the draft EIS to be present in the proposed treatment areas. All of the fish toxicity data presented is short-term acute bioassay data and almost all of it is quite old and was not developed according to present day scientific standards. As such, its value is highly questionable from the standpoint of whether or not it is adequate as an indication of short-term toxicity let alone the much more complex toxicity questions related to the aquatic ecosystem as a whole for the long-

term. A fish might initially survive exposure during chemical treatment and die later due to decreased ability to survive. A salmon might migrate through the treatment area and be unable to smolt as a result. Death would occur in seawater some distance removed from the treatment/exposure site. Fish food organisms might be adversely effected and thus, indirectly, the fish also. Salmon spawning ground sediments might become contaminated with chemical residues that could cause the death of eggs when laid later on. Reproduction might be inhibted in other ways. The draft EIS and Appendix A are silent with regard to these and many other concerns. The presentation in the draft EIS is primitive by modern day scientific standards and is so deficient as to indicate disregard for environmental protection. Reference is made in Appendix A to work that can only be classified as inadequate and inappropriate to the northwest locale (i.e., Smith and Isom's 1967 publication regarding the Tennessee Valley). It is stated in Appendix A that "No measureable toxic effect was observed on benthic fauna" by Smith and Isom. It is not mentioned that little was done to measure and that caged fish died in the treatment areas of reportedly unknown causes. The fact is, that at the levels of use for aquatic plant control adverse effects to fish and other aquatic organisms is highly probable from chemicals such as 2,4-D and endothall. With regard to fish avoidance, the draft EIS fails to note that for some toxicants fish might avoid some concentrations but not others. No information to deal with this possibility is presented in the draft EIS or Appendix A. Furthermore, even if a fish avoids a treated area the mere fact of avoidance means exposure and there is every reason to believe that levels of exposure that might cause avoidance might also cause harm.

41. Pages 58 and 59 and appropriate sections of Appendix A - The discussion of public health risks is facile and inadequate. The draft EIS admits that 2,4-D "may cause an increase in malignant tumors, birth defects, and other physiological problems in test animals" but attempts to imply that such effects could only occur at high doses. Such a presentation ignores the fundamental scientific and ethical principles involved in laboratory toxicity testing of chemicals and adhered to by such established institutions as the National Academy of Sciences that the results are directly extrapolatable to humans and that the effect occurs regardless of dose level (i.e., a carcinogen is a carcinogen is a carcinogen regardless of dose level). Although a carcinogen may cause a greater number of cancers at a higher dose, it will still cause cancer at low doses. Low doses would be present in aquatic system as a result of chemical treatment for aquatic plant control. The statement in the draft EIS that "There has never been any indication that 2,4-D, in concentrations used for aquatic plant control, would cause public health problems" is ludicrous and overlooks the nature of epidemiological studies as well as the probable fact that it is unlikely that anyone has ever really looked. It would seem to be more appropriate to state that no one has ever conducted an epidemiological study to determine the public health effects, unless the Corps has information of a contrary nature and can cite specific studies in which cancer, birth defects, mutations, and other 2,4-D related health effects were adequately studied after exposure during aquatic plant control treatment. The closest existing data which I am aware of would be phenoxy herbicide studies in Sweden, Oregon, and Washington which have indicated higher rates of cancer, miscarriages, and congenital malformations for people exposed to phenoxy herbicides including 2,4-D. The ultimate insult after injury is to rely on the EPA in Appendix A with regard to whether or not 2,4-D is a public health hazard. Although the EPA is finally reviewing 2,4-D and may eventually deregister it, the EPA moves abysmally slowly with regard to fulfilling its statutory responsibilties in this area. You should recall that after more than nine years of controversy the EPA only late this winter got around to declaring 2,4,5-T and 2,4,5-TP

"imminent hazards" to public health. Presumably, on the day before that action they were not and were still legally available for use. The EPA is following a policy for all previously registered pesticides of allowing continued use pending further evaluation. Therefore, as the EPA has admitted, the mere fact of registration is literally meaningless. Furthermore, the EPA cannot and likely has not stated that "2,4-D is not imminently hazardous to the environment" because the EPA hasn't done its evaluation yet and doesn't know. The EPA has taken the passive tack of simply not stating that it is an "imminent hazard". As used by the EPA the term "imminent hazard" is one of legal and political consequence rather than meaningful in terms of health or environmental reality. 2,4-D is not the only chemical posing a serious environmental risk. All of those chemicals listed in the draft EIS as alternatives do. There is evidence that diquat is embryotoxic, endothall is mutagenic, and that dichlobenil has never been properly tested to determine health risk.

42. Page 59 - Eagles have been sighted feeding on fish in Lake Washington and therefore are an endangered species that might be effected by a chemical control program.

43. Page 65 - Comment number 3 applies here with regard to 2,4,5-TP. It should also be noted here that 2,4-D, 2,4,5-T, and 2,4,5-TP are all phenoxy herbicides and appear to be both chemically and biologically similar. The present ban on 2,4,5-T and 2,4,5-TP due to their being "imminent hazards" to human health and the environment has finally come about due to massive scientific evidence and public pressure in the face of industry resistance and reluctant government agencies. The chemical and biological similarities of all three of these phenoxy herbicides would be more than adequate cause for not using 2,4-D for prudent and concerned persons. In addition, the scientific evidence specific to 2,4-D is quite damning in itself. You are referred to the literature search being done for Metro by Dr. Shearer. An item which I'm sure will be included in that literature search is:

Reuber, M.D. (1979). Carcinogenicity of 2,4-Dichlorophenoxyacetic acid. National Cancer Institute, Frederick, Maryland, 19 pages (Presented in Portland, Oregon on 15 June 1979).

44. Page 66 - Metro and the city of Seattle have done a considerable amount of work researching bottom screens in the field. Information which they have generated and will generate in the near future should be included herein. It is not even mentioned. Previous comments 20 and 21 apply here also.

45. Page 67 - The near total lack of consideration of biological control is most interesting in view of comment number 8 above and the statement on page 67 that such methods "may be the most economical and the least (environmentally) disruptive" in the future.

46. Page 68 - In the limited and perfunctory discussion of the no action alternative the draft EIS indicates that things will get worse than they already are in the Seattle area. This is not quantified in any way (i.e., where is the suitable substrate for expansion in the Seattle area and how much is there), doesn't deal with the question of natural "adsorption" and cycles, and seems to ignore the data generated by Metro plant surveys over the last three years that on the whole there is not an increase occurring. The question of illegal actions on the part of shoreline property owners is more a commentary on the lack of enforcement of environmental laws than anything else. Furthermore, it reflects miseducation of those property owners by the Corps and recreational boaters in an attempt to pursue agency policy.

Lt. Col. Carpenter
10 August 1979
Pag 10

47. Page 70 - It is noted on page 70 that chemical control will result in long lasting impacts on water quality due to the chemicals used and may result in accumulation of residues in the sediments. These impacts were ignored by the draft EIS in foregoing sections.

48. Page 72 - The "public participation" program to date appears to be more designed to generate support for Corps policy than to allow for meaningful participation by all affected and interested citizens. Although I requested a response to the input which I attempted to provide via the "public information pamphlet" question section, none was ever received.

49. Pages B-4 and B-5 - Were no answeres received to these letters?

50. Pages B-15 through B-36 - There are a number of pertinent comments in the letters of coordination from the Washington Department of Fisheries, U.S. Fish and Wildlife Service, and National Marine Fisheries Service that the Corps seems to have disregarded in the draft EIS. Included in those letters but not in the text of the draft EIS are identification of important wetlands areas in Lake Washington (which are nearly identical to the proposed treatment areas as per page B-27), a call for bioassays of various life-stages for important native species like salmon, notice that the toxicity data for fish such as the informationin Table 2 of Appendix A of the draft EIS is unacceptable and inadequate (by all three agencies), and the need for timing restrictions to protect salmon.

In summary, the draft EIS is inadequate as a document from which to make an informed decision regarding the topic matter. Particularly noticeable is the nearly complete lake of site specific information and the absence of a meaningful analysis of the envirnmental and health risks resultant from chemical control methods. The "benefit/cost analysis" presented in the draft EIS is totally unsubstantiated within the document. Using the same method of analysis suggested by the draft EIS the benefit/cost ratio actually is approximately 0.2 rather than the 6.5 stated in the draft EIS for the proposed Seattle area control program. Such a low ratio is far less than the break even point of 1.0 and underscores the lack of economic justification for the proposed program.

Hopefully these comments will be carefully considered. Based on the information available to me and my review of the draft EIS I do not feel that the proposed program is justifiable economically or environmentally. If there is a need for a publicly funded program it would probably best be limited to areas of public interest such as public beaches. Non-chemical alternatives would appear to be superior for such locations and are already being pursued by local governments. Wider-area control measures (such as the clearing of boat lanes), where felt to be necessary, should most appropriately be funded by the special interests that desire them such as some of the shoreline property owners, recreational boaters, and yacht clubs (not all of the persons in these categories feel that control measures are necessary). Please inform me of the results of this process and provide me with a copy of whatever document(s) result (such as a final EIS if one is produced).

Sincerely yours,

GM Zemansky

G M. Zemansky

FRIENDS OF THE EARTH

18 April 1979

Rosemary Walrod
Environmental Review Section
Department of Ecology, Mail Stop PV-11
Olympia, WA 98504

Dear Ms. Walrod:

COMMENTS

Presented To: Washington Department of Ecology (DOE)
Subject: Draft Environmental Impact Statement (EIS)
Control of Watermilfoil in Areas of Lake Washington
Reference:
1. My letter of 22 March 1979 to you;
2. Elmer C. Vogel's letter of 27 March 1979 (of DOE) to me;
3. My letter of 5 April 1979 to Elmer C. Vogel (of DOE); and
4. My testimony of 10 April 1979 at the DOE public hearing in Medina (both written and oral).

This letter constitutes the detailed written comments on the subject proposal referred to in reference (4) above. Although these comments are meant to be inclusive, references (1) through (4) above are incorporated by this reference as a part of our total comments on the draft EIS. The preparation of these comments has been hampered by the following circumstances:

1. The general inadequacy of the draft EIS. This aspect of the situation was mentioned in reference (4) above and will be dealt with in greater detail herein. As you are reported to have conceded, "the impact statement is not very technical" (Kucera, K. Lakeside residents want to poison weed. The Daily Journal-American, 27 March 1979, p. A-2). It consists nearly totally of unsubstantiated opinion without reference to technical data or facts to support the opinion. The poor quality of the draft EIS and the lack of data presented in it places an inordinate burden on persons attempting to properly review it and requires greater review effort and time;

2. The comment period is too short. Via reference (1) we requested that it be extended. That request was refused by reference (2). Due to the complexity of the issue and the inadequacy of the draft EIS as noted above, a much longer comment period should have been scheduled to allow for meaningful public input; and

3. The failure of the DOE to provide relevant documents in a timely manner as requested in reference (3) above.

We strongly object to the inappropriate manner in which the DOE has handled public participation in this matter. Via reference (2) above the DOE argued that public participation in this matter is being handled in a manner sufficient to meet the minimum legal requirements of the State Environmental Policy Act (SEPA) Guidelines (Chapter 197-10 of the Washington Administrative Code -- WAC). Whereas that may or

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may not be so, it is apparent that the SEPA Guidelines themselves are inadequate to comply with the requirements of the Clean Water Act and we believe that those requirements apply in this case, since the action is one which would waive water quality standards promulgated under that law and, as will be explained later herein is one which is apparently in violation of that law.

Section 101(e) of the Clean Water Act requires public participation "shall be provided for, encouraged, and assisted" in all phases of implementation of that law. Regulations regarding the manner in which public participation shall be handled to comply with that law are found in Part 25 of Title 40 of the Code of Federal Regulations (40 CFR 25). Among other requirements of those regulations are:

1. 40 CFR 25.4 which requires that, since "Providing information to the public is a necessary prerequisite to meaningful, active public participation", that "Agencies shall design informational activities to encourage and facilitate the public's participation". As noted in subparagraph three of page one of this letter, the failure of the DOE to provide relevant documents in a timely manner has hampered our participation and may be a violation of both state and federal law. Furthermore, 40 CFR 25.4 requires that both "interested and affected" persons be notified. As acknowledged by the DOE in reference (2) above, the DOE has not made such an effort. We believe that as a result of that lack of effort that many persons affected by this proposal may be unaware of it. We have been informed by representatives of Greenpeace that they have contacted by telephone a random selection of residents in the affected area. In so doing, they learned that many of the residents were unaware of the proposed action and that, when informed of it, some of these were strongly opposed to it; and

2. 40 CFR 25.5 which requires public notice "at least 45 days prior to the date of the hearing" for public hearings. In The Daily Journal-American article cited in subparagraph one of page one it is reported that you acknowledged that the DOE made "little effort to publicize the hearing" and attempted to justify such lack of effort by claiming that "this is not really a major proposal." We are aware of at least several persons who either did not testify or presented only very limited testimony because they learned of the hearing too late to prepare adequate comments or did not obtain a copy of the draft EIS until just prior to the hearing. This situation was worsened by the fact that the DOE provided very limited initial distribution of the draft EIS and failed to send copies of it to libraries in the area.

We feel that the manner in which the DOE has handled public participation in this case has limited meaningful public participation and is not in compliance with the requirements of federal law cited above or Washington law requireing public disclosure of documents.

The proposed action would waive water quality standards for Lake Washington to allow an application of the herbicides Aqua-Kleen, Aquathol, and/or Aquathol K (the active ingredient for the first of these is the butoxyethanol ester -- BEE -- of 2,4-D and for the next two is dipotassium endothall) by an unidentified group of private citizens allegedly consisting of "Approximately 100 property owners living near Lake Washington" who would hire A-1 Spray Services, Inc. to perform the work. Although we have requested the applicants be identified publicly via references (1), (3), and (4) above, to date the only response to that request we have received has been a refusal to provide such information as per reference (2) above. This information is

most relevant to the proposed action. We believe that the public has a right to know precisely who is proposing this action and who would finance it. Furthermore, there are questions regarding the legality of it related to property rights and the ability of private citizens to take actions effecting public areas. For example, it may be illegal for private citizens to sponsor such an action that would result in toxic substances entering the private property of other private citizens or which would result in toxic substances entering public property such as public beaches and thereby requiring that those public facilities be at least temporarily closed. No information has been presented in the draft EIS which would demonstrate that the sponsors, whoever they may be, reside on the shoreline or have obtained the consent of those who do reside on the shoreline to discharge toxic substances on their property.

The draft EIS does not identify the specific water quality standard which would be waived. In response to our question on this matter in reference (1) above, the DOE via reference (2) above has indicated that it is WAC 173-201-045(5)(b). We note that that standard specifies the "Characteristic uses" for the waters in question. We wonder if it is also the intent of the DOE to waive WAC-173-201-045(5)(c)(vii) which prohibits concentrations of toxic or deleterious materials "which may affect public health, the natural aquatic environment, or the desirability of the water for any use." Regardless, it would appear to be inconsistent with either WAC-173-201-035(8)(e), the purported basis for the ability to grant such a waiver, or WAC-173-201-035(8)(f) and relevant portions of the Clean Water Act to grant such a waiver, as I mentioned in reference (4) above and as discussed below:

1. WAC-173-201-035(8)(e) provides in part that water quality "criteria... may be modified... on a short-term basis when necessary to accomodate essential activities, respond to emergencies, or to otherwise protect the public interest." Washington water quality standards are required to be promulgated in accordance with the Clean Water Act. This portion of both state and federal law comes under the "antidegradation policy" sections. It is apparent that WAC-173-201-035(8)(e) does not faithfully comply with 40 CFR 130.17(e) and, in this case, cannot be used anyway since WAC-173-201-035 (8)(f) must also be satisfied;

2. WAC-173-201-035(8)(f) provides that "in no case, will any degradation of water quality be allowed if this degradation interferes with or becomes injurious to existing water uses and causes long-term and irreparable harm to the environment." This section of the WAC is also not faithful to the requirements of 40 CFR 130.17(e). Furthermore, it is acknowledged in the draft EIS that the proposed action would interfere with existing water uses (pages 2, 6, 14, 15, and 19) such as swimming, fishing, water supplies, and aquatic habitat; and

3. 40 CFR 130.17(e) provides that antidegradation policies "shall, at a minimum, be consistent with the following:"

(1) "Existing instream water uses shall be maintained and protected. No further water quality degradation which would interfere with or become injurious to existing instream water uses is allowable."

(2) "Existing high quality waters which exceed those levels necessary to support propagation of fish, shellfish and wildlife and recreation in and on the water shall be maintained and protected unless the State chooses, after full satisfaction

of the intergovernmental coordination and public participation provisions of the State's continuing planning process, to allow lower water quality as a result of necessary and justifiable economic or social development. In no event, however, may degradation of water quality interfere with or become injurious to existing in-stream water uses..."

The federal regulations, in summary, provide for waiver only for "necessary and justifiable economic or social development", which this proposal is obviously not, and only when exisiting water uses are not interfered with, this proposal does not meet that test either. The state regulations are inconsistent with the minimum requirements of the Clean Water Act where they would allow for waiver without meeting those minimum conditions.

It is alleged in the draft EIS that "milfoil may be dangerous to swimmers and water-skiers" (page 8) and on the cover letter attached to the draft EIS dated 19 March 1979 that "Swimming, boating, and water skiing are becoming hazardous due to surface mats of milfoil. Residents report at least three accidents caused by excessive weed growth." We note that residents in the Seattle area do not appear to have made such complaints an issue until this year even though aquatic plants have been in the area at significant levels for many years and complaints about milfoil in Lake Washington are on record since at least 1975. The sudden appearance of this issue and the lack of documented cases to support the allegation is curious. We note that prior to ever having heard such allegations made with regard to the Seattle area we heard similar allegations made in public presentations by staff personnel of the DOE with regard to the Okanagan area of British Columbia in 1978. At that time we asked for documentation to support the allegations. Ms. Halvorsen's letter of 18 May 1978 (of the DOE) and my letter of 24 September 1978 to Mr. Thayer (of the DOE) apply. The last response on this topic from the DOE was Mr. Thayer's letter of 2 October 1978 to me in which he indicated that since the rumors he made reference to may have involved alcohol abuse "since finding out about the uncertain nature of the incident I have not made reference to it in any of my presentations." Does the DOE have any reliable documentation to back up the allegations appearing in the draft EIS? If so, a copy is hereby specifically requested in accordance with the applicable state laws regarding public disclosure.

Whereas I would not recommend swimming or water skiing in dense concentrations of aquatic plants simply because that doesn't seem to be optimum conditions for those sports, it is extremely questionable that aquatic plants pose any real safety hazard. The testimony of Dr. Frank Henry at the public hearing on 10 April 1979 would tend to confirm that any problem that may exist may be more a psychological one. He implied that the "green arms" of milfoil reach up and grab persons in the water and drag them under to their death. As a trained diver who has often chosen to dive in areas where aquatic plants grow to be able to observe the more interesting environmental conditions such as the fish attracted to those habitats, I have never encountered any difficulty in swimming through such areas (either underwater or on the surface) that would constitute a safety hazard.

In an effort to clarify this question, I contacted the Evergreen Safety Council (the Washington chapter of the National Safety Council). Since aquatic plants have been around since at least before people, they are widely distributed in various parts of the country and the world, and there is undoubtedly significant interaction between aquatic plants and persons using water systems, it seemed logical that if aquatic

plants pose any real hazard to humans that there would be some record or documentation of that situation over the years (Eurasian watermilfoil is acknowledged to have been in waters of this country for approximately the last century and other types of watermilfoil are acknowledged to be native to Washington... to say nothing of the many other species of aquatic plants). I was informed by Ms. Janice Peck of the Evergreen Safety Council during a telephone conversation on 12 April 1979 that her check of National Safety Council records at that time revealed no reports or documentation of any safety hazard or accidents related to aquatic plants. Therefore, we submit that unless the DOE can present reliable evidence to support the statements in the draft EIS regarding safety and aquatic plants that all such statements should be deleted.

In the draft EIS it is stated that treatment with herbicides is proposed for five "general" areas of Lake Washington including Fairweather Bay, Cozy Cove, Yarrow Bay, Laurelhurst (Union Bay), and Mercer Island (along West Mercer Way) totalling 175 acres (the breakdown being 35, 60, 40, 20, and 20 acres respectively). Neither this information on page 3 nor the maps on pages 4 and 5 provide localization of the proposed treatment areas which would enable determination of probable impacts. At the public hearing on 10 April 1979 a chart was posted behind the speaker's podium on which what appeared to be proposed treatment areas were indicated in pink. This information, not in the draft EIS, gives a significantly different indication of the treatment area locations than the draft EIS. The most striking case involves the proposed Mercer Island treatment area. In the draft EIS the line pointing to the general area indicates an area far to the south of the Interstate-90 floating bridge (no scale is given). The chart at the hearing indicated an additional area to the east of Faben Point, north and east of the bridge and nowhere indicated in the draft EIS. Furthermore, there is no indication in the draft EIS of the location of areas which might be highly sensitive to the proposed application of herbicides such as public beaches, private beaches, and established fishing areas. What, for example, is the proximity of beaches on Mercer Island to the proposed treatment areas and might they be impacted directly or via drift? There is no information in the draft EIS to allow such determinations to be made.

Neither is the information in the draft EIS adequate to determine precisely what plants are growing where and whether or not any treatment or management effort should be considered. The closest the draft EIS comes is a map on page 10 which is of such general nature that it is useless for that purpose. For example, according to that map one would not expect to find aquatic plants near Laurelhurst, since no plants are identified on that map as being there. Of course, neither do the maps on pages 4 and 5 nor the map on page 10 identify property classifications in the proposed treatment areas. Furthermore, the draft EIS avoids the question of what the real problem is in the first place. Is it merely watermilfoil or aquatic plants in general? Does just looking at watermilfoil, presuming some type of watermilfoil control is undertaken, solve anything? As acknowledged on page 15 of the draft EIS control of watermilfoil might lead to replacement by other species which might also "develop to nuisance proportions." Additionally, the DOE could significantly upgrade the quality of the discussion in this matter if it would avoid making the value judgement that watermilfoil and other aquatic plants are "weeds". As is very briefly acknowledged on page 8 of the draft EIS aquatic plants have many beneficial functions in the aquatic environment including habitat for fish and birds. Many species of fish lay eggs on aquatic plants and would be unable to reproduce without their presence. Insects which serve as fish food organisms live on aquatic plants. The literature is

full of references to the important roles played by aquatic plants in the aquatic environment. The following is a selection citations acknowledging that fact:

1. Mulligan, H.F. (1969). Management of aquatic vascualr plants and algae. IN: Eutrophication: Causes, Consequences, Correctives, National Academy of Sciences, pp. 464-482.

"Benthic macrophytes play a vital role in the aquatic environment. These organisms produce oxygen through photosynthesis, shade and cool the sediments of the littoral zone, slow water movements and provide habitats for sessile benthic organisms, regenerate sybstances from the sediments to the water, provide surfaces for attachment by bacteria, periphyton, and aquatic insects, serve as food, nest-building material, and sites for egg attachment for aquatic insects and fish, provide nesting sites for fish, protect small fish from predation, convert inorganic material to organic material, serve as food for game birds and animals, (and) anchor the soil in place by means of their attenuated root systems."

2. Municipality of Metropolitan Seattle. (1976). Aquatic plant control in Lake Washington's Union Bay. Staff Report. Seattle, 20 pp.

"The milfoil has certain beneficial, as well as detrimental, effects. Macrophytes in general play a vital role in the aquatic environment, including: producing oxygen through photosynthesis; shading and cooling the sediments of the littoral zone; slowing water movements and providing habitats for sessile benthic organisms; regenerating substances from the sediments to the water; providing surfaces for attachment by bacteria, periphyton and aquatic insects; serving as food, nest-building material and sites for egg attachment for aquatic insects and fish; providing nesting sites for fish; protecting small fish from predation; converting inorganic material to organic matter; serving as food for birds and other animals; (and) anchoring the soil in place by means of their attentuated root systems."

3. The Working Group on Submerged Aquatic Vegetation of the Chesapeake Bay Program. (1977). Submerged aquatic vegetation plan of action. Research proposal for on-going studies funded by the U.S. Environmental Protection Agency (EPA), U.S. Fish and Wildlife Service (FWS), and the Maryland Department of Natural Resources available from the Region 2 office of the EPA, Philadelphia, 25 pp.

"The problem is the sharp decline or change in density, diversity, and distribution of submerged aquatic vegetation (SAV). This decline is significant due to the multiple functions of these grasses in the Bay ecosystem. They provide food, shelter, habitat, and breeding areas for fin and shellfish, water fowl, and species of the lower trophic levels; provide bottom stability thereby protecting against shoreline erosion; and also serve to control turbid conditions... (this study was undertaken due to the concern over the decrease of aquatic vegetation in general in the Chesapeake Bay area including Eurasian watermilfoil)."

Whereas the draft EIS mistakenly implies that Eurasian watermilfoil is somehow so different from other aquatic plants that it does not have these beneficial aspects, absolutely no information to support such a position is given. Where is it, if it exists? On the contrary, available information indicates that Eurasian watermilfoil serves the same important beneficial functions in the aquatic environment as other aquatic plants do. For example, mallard ducks, Canadian geese, and coots have been

observed "feeding in dense patches of M. spicatum (Eurasian watermilfoil)" in lakes in the Seattle area (Goodpasture, J.M.; J.I. Davis; and R.I. Matsuda. A study of the composition, growth and distribution of aquatic macrophytes in fourteen lakes and bays of King County. Municipality of Metropolitan Seattle, 1977, 36 pp.) and some fishermen point to the attractiveness of dense stands of Eurasian watermilfoil as a place to fish for bass because of their association with the plants due to the abundance of fish food organisms and cover thus supplied (Friedman, M. Tactics for bass in thick weeds. Fishing Facts, May 1978, 5 pp.).

On pages 12 and 13 of the draft EIS it is mistakenly concluded that "no shoreline management permit is required" for the proposed use of herbicides. It would appear that the DOE did not contact the local jurisdictions with responsibilities for shorelines management. When I did in late March 1979 I was told by representatives of the cities of Kirkland, Medina, and Mercer Island that they had been unaware of the proposal but that their tentative determination was that a permit under the shorelines management program would be required for the use of herbicides. On 11 April 1979 Ms. Anita Frankel of the City of Seattle Office of Policy Planning stated at a meeting of the Municipality of Metropolitan Seattle aquatic plant study technical committee that the Seattle Department of Community Development had determined that a permit would be required under its shorelines management program for waters under its jurisdiction in Union Bay. A permit would not be required for mechanical harvesting.

On pages 3, 6, 7, 14, and 15 the herbicides proposed for use are generally discussed. This information is totally deficient to describe the potential environmental impact of the proposed action. It is strongly implied by such statements as "If a granular material is used, it is applied directly to the weeds, as the material sinks rapidly and does not spread" (on page 3 of the draft EIS) and "By studying the characteristics of water movement in the areas to be treated prior to application of herbicides, circulation of the chemical to nontarget areas can be minimized" (on page 15 of the draft EIS) that herbicide drift (and thereby potential risk) is not an important factor. No information to support those statements in the draft EIS is presented nor is any information on water movements or wind in the proposed treatment areas given (as is indicated in the second quotation above, the DOE appears to have none). The drift from aquatic herbicide applications may be very significant whether liquid or granular formulations are utilized. For example, the South Okanagan Environmental Coalition (SOEC) confirmed drift on the order of one mile or more from 2,4-D BEE granular applications (Aqua-Kleen was used) during the summer of 1978 in limited areas of the Okanagan lake system, despite provinvial government assurances that such drift would not occur. In one case, Aqua-Kleen was applied to a 13 acre plot on the south Kelowna foreshore on 22 June 1978. On 26 June 1978 2,4-D was detected 6,200 feet north of the application site. Winds had blown the 2,4-D "on the surface at least one mile north of the application site against the prevailing current (Warnock, J.W. SOEC press release, 9 August 1978, 1 p.). In a second case which occurred on 14 August 1978, Aqua-Kleen was again applied. This time to a 10 acre site near the Summerland Yacht Club. On 16 August 1978 2,4-D was detected 1,500 meters (nearly one mile) north of the treatment site. On 18 August 1978 2,4-D was detected 1,500 meters south of the treatment site. Water intake pipes were impacted in both cases (SOEC. Report on the Summerland 2,4-D application August 14, 1978. Penticton, B.C., 6 pp.). Provincial government reports on these incidents are not yet available. Another aspect of the

drift question is concentration gradients which may form of the herbicides. Such gradients have been observed during 2,4-D applications to exceed a factor of five difference in concentrations of 2,4-D detected in the vertical water column after the application. The degree of gradient in concentrations would likely vary as a function of physical and chemical properties of the specific herbicide used, physical properties of the water such as temperature gradient, and currents and wind, among other possible factors. In the Guntersville Reservoir case, of the Tennessee Valley Authority (TVA) in 1969, gradients shortly after application indicated higher concentrations on the surface than the bottom and an intermediate concentration value in the middle of the water column (4.8, 3.1, and 1.4 mg/l of 2,4-D from top to bottom respectively 8 hours after application). Nearly uniform conditions were observed two weeks later; however, a gradient had reformed at lower levels 3 months later (42, 36, and 23 ug/l from top to bottom respectively)(Wojtalik, T.A.; T.F. Hall; and L.O. Hill. Monitoring ecological conditions associated with wide-scale applications of DMA 2,4-D to aquatic environments. Pesticides Monitoring Journal, Vol. 4, No. 4, pp. 184-203, March 1971). Much higher gradients have been observed during the use of toxic substances in water and may be possible with 2,4-D and endothall. Studies have been reported where gradients exceeded a factor of ten (R.H. VanHaagen. Personal communication. 1979).

It is stated on page 3 of the draft EIS that the formulations of 2,4-D and endothall proposed for use are registered by the EPA for the intended use. It is also stated that prior to registration the EPA is required to ensure that the chemical being registered "will perform its function without unreasonable adverse effects on the environment". Whereas both of those statements are true, it is highly misleading to apply them in this case because, as is not stated in the draft EIS, the EPA has failed to perform its statutory responsibilities with regard to the section of the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) referred to and the EPA has admitted that to be the case (it has also been documented by the U.S. Congress, U.S. Government Accounting Office, National Research Council, and Science magazine). The herbicides we are discussing, 2,4-D and endothall, were registered prior to the 1972 amendments to the FIFRA. It was those amendments which required that pesticides be proven both efficacious and safe prior to registration and that all pesticides registered at that time would have to be reregistered to meet the upgraded standards. In U.S. Senate hearings in 1976 it was documented that the EPA reregistration program had "collapsed". The report of those hearings was a scathing indictment of EPA failure "in its responsibility to assure the safe use of pesticides as mandated by the Congress." The EPA's failure with regard to 2,4-D was singled out for being "A clear example of EPA's failure to evaluate data" (Subcommittee on Administrative Practice and Procedure. The Environmental Protection Agency and the Regulation of Pesticides. Staff Report, U.S. Senate, Washington, D.C., 1976, 50 pp.). In response to my letter of 12 January 1979 to Robert A. Poss (Chief of the Pesticides and Toxic Substances Branch of the Region X office of the EPA) in which I specifically listed 2,4-D and endothall in requesting information on the registration status of herbicides I was notified that "none of the chemicals you listed have been reregistered" (R.A. Poss's letter of 19 January 1979 to me, 2 pp.). In response to my letter of 29 October 1978 on the topic to Steven D. Jellinek (Assistant Administrator for Toxic Substances of the EPA in Washington, D.C.) I was notified that:

"I agree with you that there are many registered pesticides currently on the market that may potentially pose the risk of 'unreasonable adverse effects' on

humans or the environment. When EPA assumed authority for regulating pesticides, there already were thousands of products on the market. Really stringent requirements for pesticide safety testing postdate EPA's initial involvement in pesticide regulation by several years."

In the same letter, Assistant Administrator Jellinek provided me with an update on the status of 2,4-D. In February 1978 I was informed by the Washington, D.C. office of the EPA that with regard to 2,4-D:

"The chemical has been placed in the pre-RPAR status because it is potentially carcinogenic and may be hazardous to non-target organisms. The Agency's Cancer Assessment Group (CAG) through an informal review found positive evidence that 2,4-D is carcinogenic." (R.L. Reising's letter of 28 February 1978 to me, 2 pp.).

According to Assistant Administrator Jellinek in his 17 January 1979 letter:

"2,4-D was referred to the Special Pesticides Review Division and has been accepted as an RPAR candidate; it will, in turn, receive a thorough review.

The RPAR process is the process through which pesticides are reviewed and may be eventually deregistered. You are undoubtedly familiar with the fact that the herbicide 2,4,5-T, for example, has been undergoing the RPAR process for approximately the past year. 2,4,5-T has chemical and toxicological properties which are similar to 2,4-D, which is not surprising since both are members of the phenoxy herbicide family. On 1 March 1979 the EPA publicly announced an "emergency suspension" of 2,4,5-T on the impetus of recent epidemiological evidence that 2,4,5-T is related to miscarriages in humans as a result of forest applications.

In summary, with regard to this topic, mere fact of registration is essentially meaningless from the standpoint of potential for adverse human health and environmental effects and the EPA has admitted that to be the case. The EIS should be changed to reflect this fact.

Furthermore, whereas the Washington Department of Agriculture has separate registration responsibilities for pesticides used in Washington state, that essentially provides no additional safeguards. With regard to 2,4,5-T, for example, state suspension did not occur until nearly three weeks after federal suspension. I am unaware of any cases where the state has taken more stringent action regarding pesticides registration safety data than the EPA has. Is the DOE? The fact that the state certifies pesticide applicators is also of little comfort, since that consists of little more than ensuring that they are able to read the labels. The numerous cases of negligence by pesticide applicators which have been documented by the state after citizen complaints is indicative of the problem. One such case occurred in Seattle last year when Washington Tree Service, during an aquatic herbicide application at City of Seattle beaches, failed to comply with label requirements and was cited for negligence.

Information in the draft EIS on 2,4-D BEE and endothall toxicity, environmental effects, and environmental chemistry (including persistence) is extremely limited and is presented in a misleading manner. Most of the information on toxicity in

Appendix D for 2,4-D is acute toxicity information developed some time ago for species that are not identified to be native to the Lake Washington proposed treatment area in the draft EIS and for endothall the very limited information presented is all acute information for non-native species that is generally quite old in origin. The absence of chronic information is striking and a critical deficiency in the draft EIS. The absence of information on non-fish species is also striking.

The general situation on information for pesticides is worthy of comment herein. There is a fair body of literature regarding the acute effects of 2,4-D, although little of it applies to species of fish or other organisms native to the Seattle area. There is almost no chronic information. There is very little information at all in the public literature on endothall and almost all of what is available is dated and, as with 2,4-D, is acute information rather than chronic. Since February 1978 and October 1978, for 2,4-D and endothall respectively, I've had Freedom of Information requests in to the EPA's Washington, D.C. office to attempt to obtain whatever information they have on file that was used to support registration regarding toxicity and environmental chemistry. To date, the EPA is apparently in violation of both the FIFRA and the Freedom of Information Act in that the requests have not been fulfilled. I have, however, been able to see some of the applicable indices listing what information is on file. Judging by those documents, the information on file is likely seriously deficient with regard to meeting the requirements of the 1972 amendments to the FIFRA. Nevertheless, whatever information is on file should be considered in the draft EIS and is not. When I questioned DOE representatives at the 10 April 1979 public hearing regarding this discrepancy, I was told that the DOE does not have that information either and, therefore, it would not be made available to the public. That fact is a damning indictment of this process in that information critical to proper evaluation of the proposal has not been made public by either government agencies with responsibilities to the public or industry. Given the knowledge that is available concerning the EPA's pesticide registration process, it is an irrational act to use such pesticides prior to a full review of such information and where the decisions fall in the public domain, as is the case here, that information should be made public.

On page 14 of the draft EIS the statement is made that "The toxicity of 2,4-D to fish has been widely studied." That statement as such is misleading in that, if anything, it would only apply to acute toxicity information. There is nearly a total lack of chronic toxicty information. As stated further on that page, the acute toxicity of 2,4-D BEE to salmon species which may be in Lake Washington has been found to be less than 1 mg/l. In fact, in the reference cited in the draft EIS (Servizi, 1979), 100 percent mortality was observed at 1 mg/l for all species and significant mortality was observed at 0.7 mg/l in short-term bioassays. In longer term bioassays with eggs or alevins to fry significant mortality and reduced growth was seen at 0.3 mg/l. The toxicity of 2,4-D to benthic and planktonic fish food organisms is also important. For example, 2,4-D BEE 96-hour median lethal concentration (LCm) of 440 μg/l to the scud. Such data is absent from the draft EIS. The essential absence of chronic toxicity information in the draft EIS is, as already mentioned, an important deficiency in the draft EIS. How important is noted by the following quotes:

1. Cameron, J.J. and J.W. Anderson. (1978). Results of the stream monitoring porgram conducted during FY 1977, herbicide spray project. U.S. Bureau of Land

Management, Coos Bay, Oregon, 54 pp.

"The careful review after an extensive literature search leads to a scientific conclusion that researchers have conducted very little work on low level, long term toxic effects of herbicide 2,4,5-TP and 2,4-D on aquatic communities. Most aquatic studies have been related to acute toxicity levels for fish. This lack of work on lower trophic levels means that an enormous data gap exists. The base of the aquatic food pyramid is much larger in species abundance and diversity than the fish communities at the top of the pyramid. The lack of research data on the base of the food pyramid makes it impossible for field personnel involved in these projects to even remotely understand the overall impact of herbicides on aquatic communities where contamina''-n occurs."

2. Morley, R.L. and D.S. Reid. (1977). 2,4-D: a summary of information relative to its possible effects on fish and wildlife whe used in aquatic weed control programs. Fisheries Technical Circular No. 27, Ministry of Recreation and Conservation, British Columbia, Canada, 8 pp.

"Low concentrations of 2,4-D maintained over a period of time could cause sublethal damage that is not readily recognizable. Such effects can lead to gradual decreases in fish populations through increased predation, reduced reporduction, increased susceptibility to parasites, disease, and starvation. Morphological and histochemical changes in tissues and organs have been demonstrated for sublethal doses of several herbicides... (Pathological changes were found in bluegills exposed to sublethal doses of 2,4-D propylene glycol butyl ester five months after single water treatments) These changes were marked depletion of liver glycogen, collection of glycoproteins in the blood stream, and engorgement and stasis of the circulatory system of the brain. This response was detected down to the o.1 ppm concentration of 2,4-D (the lowest concentration tested)."

Standard procedure for estimating necessary water quality criteria for aquatic habitat protection is to use an application factor of 0.01 in the absence of chronic toxicity information. Using such an application factor in this case for 2,4-D BEE would result in a value of approximately 4 µg/l from known information. Even such relatively low levels may be hazardous to aquatic organisms. For example, there is information "that 2,4-D levels in the order of 1.0 µg/l in surface water may pose a threat to... invertebrate communities" (Gummer, W.D. Pesticide monitoring in the prairies of western Canada. Unpublished report, Water Quality Branch, Environment Canada, Regina, Saskatchewan, April 1978, 30 pp.).

According to the draft EIS (page 6), the proposed application would result in 2,4-D concentrations in the range of 2 to 2.5 mg/l. That concentration is far in excess of concetrations cited above known to be acutely toxic to salmon and may be more than three orders of magnitude (i.e., more than a factor of 1,000) greater than concentrations which could cause harmful chronic toxicity.

It is stated on page 14 of the draft EIS that "Fish have been observed to avoid low concentrations of 2,4-D in water", thereby implying that outmigration from the area of application might lessen the adverse impact. No references are cited. There is evidence to the contrary and there is evidence that aquatic organisms may be attracted to one concentration of a toxicant, repelled by another, or neutral despite the adverse effect that results. For example, one recent series of tests with

herbicides found that (Folmar, L.C. Avoidance chamber responses of mayfly nymphs exposed to eight herbicides. Bulletin of Environmental Contamination and Toxicology, Vol. 19, No. 3, pp. 312-318):

"No avoidance of 2,4-D DMA was observed at 10 mg/l; however, when the concentration was increased to 100 mg/l, a 70% mortality occurred still with no avoidance. The nymphs displayed a marked attraction to 1 mg/l dalapon. Attraction of aquatic organisms to one concentration of a toxicant and avoidance of another was demonstrated with rainbow trout... and with whitefish... The nature of this biphasic response is difficult to interpret when a limited range of test concentrations are used; if the range were enlarged, perhaps an attraction as well as an avoidance concentration could be determined for each of the test chemicals."

The information in the draft EIS on page 14 regarding 2,4-D persistence in the aquatic environment is misleading. It is implied that "2,4-D decomposes rapidly", even though it is acknowledged that water column residues may persist "for as long as 120 days." It is stated that "83 percent of the 2,4-D applied to conditioned lake muds was biologcially decomposed within 24 hours." The reference for that statement is indicated to be "(Ref. 3)" which is listed on page 20 of the draft EIS as Lorz, et al. (1978). Besides the fact that it is unlikely that Lake Washington sediments are equivalent to whatever "conditioned lake muds" are, that statement conflicts with the bulk of information in the literature. In attempting to check the basis for the statement I reviewed the portions of Lorz, et al. (1978) which pertain to 2,4-D behavior in the environment, pages 31 through 33 of that reference. I was unable to locate the information. Can you refer me to precisely where it is? There was, however, other information of significance not quoted by the authors of the draft EIS. For example, the statement on page 31 that 2,4-D ester formulations such as 2,4-D BEE (the active ingredient of Aqua-Kleen) are preferred for forest applications for several reasons including their "persistence in the environment" despite the fact that they are "10 to 100 times more toxic to fish and other aquatic organisms than the dimethylamine salt and the statement on page 32 regarding the variability of reports in the literature of 2,4-D persistence with the low case specifically cited after that statement of persistence "up to 120 days" and the higher case that "only 40% degradation of 2,4-D in water (occurred) in 6 months under excellent conditions for biological activity." Besides being misleading, the data in the draft EIS appears to be selectively biased. Additionally, on page 14 of the draft EIS it is stated that persistence of 2,4-D in sediments in the TVA system was "less than one year." That statement is inaccurate and misleading. It is purportedly based on "(Ref. 4)" which is listed on page 20 of the draft as being TVA (1972). In actuality, TVA (1972) is based on earlier work done in 1966 after the application of 2,4-D BEE (Smith, G.E. and B.G. Isom. Investigation of effects of large-scale applications of 2,4-D on aquatic fauna and water quality. Pesticides Monitoring Journal, Vol. 1, No. 3, pp. 16-21, 1967). In that sampling program, the longest period samples were taken after treatment was 10 months in the Watts Bar reservoir. At that time, all four sediment samples were measured to contain significant levels of 2,4-D and one of these was very high. Based on the known persistence and environmental dynamics of 2,4-D, with such significant levels after 10 months persistence undoubtedly exceeded one year; however, since no more samples were taken the evidence is not presented in that report to say one way or the other.

The potential human risk from 2,4-D use is not discussed in any detail in the draft EIS other than to allege that "It is less toxic to humans" (page 7) than endothall.

Apparently the DOE is only concerned with acute toxicity of 2,4-D to humans and has not considered the longer-term risk. We agree with the major portion of the testimony presented at the 10 April 1979 hearing by Dr. R.W. Shearer. In that testimony the following is stated:

1. "2,4-D is a proven teratogen in rats and mice, and therefore is almost certain to be able to induce birth defects in humans and domestic animals as well";

2. 2,4-D "is also a weak mutagen";

3. 2,4-D has demonstrated "Its ability to promote tumor formation from precancerous skin cells of mice"; and

4. "Chronic exposure of rats to 2,4-D results in damage to the higher nervous system of gradually increasing degree. Such injury in humans is only partially repaired even after years."

Dr. Shearer's statements are well supported by the scientific literature. That 2,4-D is teratogenic is unquestionable (Courtney, K.D. Prenatal effects of herbicides: evaluation by the prenatal development index. Archives of Environmental Contamination and Toxicology, Vol. 6, pp. 33-46, 1977, for example). 2,4-D is also mutagenic (Seiler, J.P. Phenoxyacids as inhibitors of testicular DNA synthesis in male mice. Prepublication copy of paper to appear in Bulletin of Environmental Contamination and Toxicology, Vol. 21, 1979, 5 pp., for example). There is debate over whether or not 2,4-D is carcinogenic. As Dr. Shearer indicated, the testing which has been done "is grossly inadequate by today's standards". However, it is noted in the U.S. Senate document referred to on page 8 of these comments that:

"An independent pathologist, who reviewed the raw data on the study at the request of subcommittee staff, concluded that 2,4-D 'is carcinogenic (cancer-causing) in rats.'"

Furthermore, review of this data more recently by the EPA's CAG, as referrenced on page 9 of these comments, resulted in a similar determination and there is no question that 2,4-D is a co-carcinogen. Other effects are likewise well proven, such as 2,4-D caused damage to the human nervous system including the brain either orally or via skin contamination (Goldstein, N.P.; P.H. Jones; and J.P. Brown. Peripheral neuropathy after exposure to an ester of dichlorophenoxyacetic acid. Journal of the American Medical Association, Vol. 171, No. 10, pp. 1306-1309, 1959 and Dudley, A.W. and N.T. Thapar. Fatal ingestion of 2,4-D, a common herbicide. Archives of Pathology, Vol. 94, No. 3, pp. 270-275, 1972).

As stated on page 15 of the draft EIS "Little information is available about the effects (of endothall) on fish and marine life." That reason in itself is sufficient to indicate that such a substance should not be used. The statement in the draft EIS following the above statement is misleading in that it that the available information regarding Aquathol formulations of endothall indicate low toxicity and high biodegradability. No information is presented in the draft EIS regarding endothall persistence. As noted on page 14 of the draft EIS in the discussion regarding 2,4-D, toxicity data may vary widely and certainly is dependent on species of test organisms. The only information on toxicity presented in the draft EIS for endothall is acute

toxicity of unspecified formulations of endothall to fish species not identified to be native to Lake Washington. In looking up some of the references which are incompletely listed in Appendix D of the draft EIS I found that most did not appear to refer to the toxicity of the dipotassium endothall formulation at issue in the draft EIS at all, but rather other formulations of endothall such as the disodium. Toxicity may vary from formulation to formulation as well as species to species. For example, the dimethylococoamine salt of endothall is reported to be lethal to fish at concentrations ranging from 0.3 to 1.0 mg/l (Walker, C.R. Endothall derivatives as aquatic herbicides in fishery habitats. Weeds, Vol. 11, No. 3, pp. 226-232, 1963). Whereas I didn't check all of the cites, all of the ones I did check were found to be for other formulations. Bond, Lewis, and Fryer (1960), for example, concerns disodium endothall and Surber and Pickering (1962) concerns the disodium and the hexahydropthalic acid formulations. Other references indicate that Davis and Hughes (1963) and Lindaberry (1961) are concerned with the acid or disodium formulations rather than the dipotassium. Interestingly enough, whereas some of these references do in fact indicate relatively low acute toxicity to the warm-water species of fish tested, others do not. For example, whereas Surber and Pickering (1962) reported a 48-hour LCm range for endothall acid to fathead minnows of 480 to 660 mg/l and disodium endothall to bluegills of 240 to 320 mg/l (not 390 as listed in the draft EIS) there is a reported 48-hour LCm of 0.257 mg/l for endothall acid to bluegills (Pimental, D. Ecological effects of pesticides on non-target species. EPA Report No. EPA-540/9-71-006, Washington, D.C., 225 pp., 1971). Furthermore, despite the alleged relatively low toxicity of endothall there are field observations of significant acute and chronic toxicity that have apparently resulted from its use to fish and other aquatic organisms. Four of these are cited below:

1. Seaman, D.E. and T.M. Thomas (1966). Absorption of herbicides by submersed aquatic plants. California Weed Conference Proceedings, Vol. 18, pp. 11-12.

"Unfortunately, some problems were encountered in our field tests with MDMA-endothall during the summer of 1965. An application at 1 ppm for 10 hours gave only partial control of American pondweed... with no apparent effects on fish. A repeated application ... for 5 hours killed about 80 percent of the weeds, but numerous minnows, green sunfish, and tadpoles were also killed... These limited trials indicated that an important advantage of MDMA-endothall (that of not injuring fish) might be negated by the necessity of using concentrations higher than 1 ppm to control American pondweed..."

2. Sterns, S.L. (1975). The effects of dipotassium endothall on the zooplankton and water quality of a small pond. Water Resources Bulletin, Vol. 11, No. 6, pp. 1221-1231.

"... the disappearance of endothall in the treatment pond was slow at first until about the thirteenth day after treatment (at an initial treatment of 5.0 mg/l the concentration ranged between 5.0 and 315 mg/l for the first 12 days)... Chlorophyll a concentrations in water samples from both ponds (treated and control) were analyzed... These analysis indicate a decrease in the chlorophyll a content of the treatment pond to nearly zero two days after treatment, probably due to a reduction in the phytoplankton in this pond due to the dipotassium endothall."

3. Sterns, S.L. (1977). Effects of dipostassium endothall on rooted aquatics and adult and first generation bluegills. Water Resources Bulletin, Vol. 13, No. 1, pp. 71-80.

"Growth of bluegills was greater in the control pond than the treated pond when the density levels were similar. This may have been due, at least in part, to slightly higher water temperatures in the control pond or some unknown differences between the ponds. The poorer growth of bluegills in the treated pond also may have been due to some sublethal effect of the endothall on bluegill growth even though no adverse effects of the dipotassium endothall on fish food organisms were found."

4. Holmberg, D.J. and G.F. Lee. (1976). Effects and persistence of endothall in the aquatic environment. Journal of the Water Pollution Control Federation, Vol. 48, No. 12, pp. 2738-2746.

"There appeared to be a decrease in chlorophyll content in the treatment pond within a few days of treatment, which was probably due to the (dipotassium) endothall killing chlorophyll-bearing phytoplankton."

Although the persistence of endothall is undoubtedly less than for 2,4-D, there is evidence in the literature that persistence in the aquatic environment is substantial (i.e., on the order of weeks to months rather than hours or days). Two appropriate cites are listed below:

1. Yeo, R.R. (1970). Dissipation of endothall and effects on aquatic weeds and fish. Weed Science, Vol. 18, No. 2, pp. 282-284.

Both the disodium and dipotassium salts of endothall were applied to reservoirs and "growth pools". Concentrations in reservoirs persisted for approximately 20 days. At application rates from 0.3 to 3.0 mg/l approximately half of the applied concentration was detected after 12 days. For the growth pools at application rates of 0.5, 1.0 and 4.0 mg/l "slightly less than one-half of the applied endothall was dissapated in 12 days... Smallmouth bass and green sunfish were not harmed. Several mosquitofish were killed; females were consistendly more susceptible than males..." (emphasis added).

2. Sikka, H.C. and C.P. Rice. (1973). Persistence of endothall in aquatic environment as determined by gas-liquid chromotography. J. Agr.Food Chem., Vol. 21, No. 5, pp. 842-845.

Aquathol K was used (dipotassium endothall) at a rate of 2 mg/l. Less than the applied amount was found in the water during the first analysis, 1 day after treatment. "There was a slower and steady decrease in endothall concentration in the water between 3 and 22 days following treatment". During this period endothall concentrations persisted at about half of the applied rate. Endothall was last detected in the water on day 29 (the next sampling day was 36). "...the endothall concentration in the top inch of hydrosoil continued to increase up to 22 days after treatment, when it contained 0.44 ppm of the herbicide... (it) began to decline after 22 days and no endothall could be detected in the top inch of hydrosoil 44 days after treatment."

The concentrations of endothall in the hydrosoil is of more than passing interest since Pimental (1971) which I cited on page 14 of these comments reports that "at concentrations of 0.1 to 0.6 ppm, bottom organisms concentrated endothall approximately 200-fold in three weeks".

Temperature seems to play a more important role with regard to endothall than 2,4-D It is stated on page 6 of the draft EIS that "To be most effective they (Aquathol and

Aquathol K) should be applied when the water temperature is 65 degrees or above." However, no guarantees are given that it will only be used in such an effective manner and no indication is given in the draft EIS of the expected water temperatures in Lake Washington. 65 degrees fahrenheit (°F) is approximately 18.3 degrees centigrade (°C). Although temperatures in some bays and inlets may vary, reported surface temperatures of Lake Washington rarely exceed 18.3 °C until July, a month after the proposed time of application in the draft EIS. For example, in 1976 reported surface temperatures up to 14 July had not exceeded 17.9 °C. On 15 July the temperature reached 19.2 °C and did not decline below 18.3 °C again until late September (Edmondson, W.T. Trophic equilibrium of Lake Washington. EPA Report No. EPA-600/3-77-087, Corvallis, Oregon, 35 pp., 1977).

As stated on page 12 of these comments with regard to 2,4-D, information on the human health risk of endothall to humans is essentially absent, both acute and chronic. In the same testimony mention on page 13 of these comments, Dr. Shearer referred to the near total absence of chronic toxicity information available to the public on endothall. Armstrong (1974), the first reference listed on the top of page 22 of the draft EIS, has little to say on the topic either; however, he does say the following:

"Human Safety: Endothall formulations may be irritating to skin, eyes, and mucous membranes. Ingestion may cause vomiting and diarrhea. It is known to have cytological effects on chromosomes and has been found to be mutagenic for *Drosophilia melanogaster* (Hadder, 1970)."

In other words, it appears that endothall is mutagenic. Why was this important piece of information not in the draft EIS when the DOE apparently had sufficient access to the document in which it appears to reference the document and extract Table 1 from it? With regard to acute toxicity to humans, endothall is known to have relatively high acute mammalian toxicity.

The draft EIS is silent with regard to contaminants and degradation products of either 2,4-D or endothall. This is another deficiency. It is known, at least for 2,4-D, that several toxic contaminants and/or degradation products will be present whenever 2,4-D is used. At the least, these include 2,4-dichlorophenol (2,4-DCP) and several forms of dioxins (such as 1,3,6,8-tetrachlorodibenzo-para-dioxin and hexachlorodibenzo-para-dioxin) (Faust, S.S. and O.M. Aly. Some effects of 2,4-D and 2.4-DCP on drinking water quality. *Proceedings of the Northeastern Weed Control Conference*, Vol. 17, pp. 460-470, 1964; Record of telephone communication between W. Crumett of Dow Chemical Company, Midland, Michigan and G. Bonci of NCAP, Eugene, Oregon on 21 June 1978; *IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man*, Vol. 15, pp. 111-138, 1977; Warnock, J.W. and J. Lewis. The other face of 2,4-D, SOEC, Penticton, B.C., 176 pp., 1978). Degradation of 2,4-D from attaclay granules of the type found in Aqua-Kleen leads to an initial release of large amounts of 2,4-D and small amounts of 2,4-DCP. Gradually, the concentration of 2,4-D peaks and declines as all of the 2,4-D is released and is diluted and degrades. There is a lag peak and decline of 2,4-DCP which effectively extends the period of toxicity in the water past the point when 2,4-D may no longer be detectable since 2,4-DCP is also toxic (Faust and Aly, 1964 cited above). Faust and Aly (1964), cited above, gives an idea of the persistence of 2,4-DCP as follows:

"The 2,4-Dichlorophenol released from granular forms of 2,4-D (1 a2d 3 mg/l dosages) persists at concentrations high enough to affect odor levels of a natural surface water for at least 218 days."

Of course, the presence of toxic contaminants and degradation products not only extends the period of toxicity but complicates prediction of toxic effects and makes it very possible that additive synergy may occur so that overall toxicty is more adverse than for the individual pure chemicals by themselves. Recently released water quality criterion documents included a proposed 2,4-DCP criteria of 0.4 ug/l for protection of freshwater aquatic life and 0.5 ug/l for human health considerations (EPA. 2,4-Dichlorophenol Ambient Water Quality Criteria, Washington, D.C., 42 pp., 1979). Little information is available regarding the toxicity and/or identity of other degradation products or contaminants for 2,4-D or endothall.

Much is made in the draft EIS of the fact that the applicator proposes to use air boats instead of boats with propellers. It is stated that this fact reduces agitation of the water and "allows for more accurate placement of material." Whereas that may or may not be so, it would seem to be of little importance and may be a disadvantage. Lack of initial mixing may lead to more likelihood of concentration gradients in the short run and in the long run significant drift can be expected anyway. Does the DOE have any documentation or references to prove their allegation that the use of air boats is in any way superior in this regard? None is cited in the draft EIS (page 7).

The discussion on pages 16 and 17 regarding alternatives to the use of herbicides in the event that a control program is appropriate is also devoid of hard information or documentation. It appears to consist of biased and/or misleading unsubstantiated opinion. The level of ignorance thus demonstrated is appalling. It is highly evident that the DOE representative to the Municipality of Metropolitan (Metro) aquatic plant study technical committee has not been present at most of the meetings, since the DOE appears to be totally uninformed on the topic. I will discuss briefly the mechanical harvesting, habitat manipulation, and no action alternatives. Although the potential for biological control remains high (and to some degree may be a part of the no action alternative), lack of research support on fundamental aspects of aquatic plant dynamics and possible biological control techniques specific to this area makes a meaningful comment on this topic difficult.

The draft EIS dismisses the mechanical harvesting alternative due to "difficulty of disposing of the vegetable matter, cost..., avoiding spread of plants", its "non-selective" nature, and the alleged slowness (implying that this alternative is infeasible for large-scale programs). No documentation or facts to back up those allegations is given (page 16). In fact, they appear to be either immaterial to the issue, have a high probability of solution, or are simply incorrect. Disposing of harvested material must be planned for; however, does not appear to be a real problem since there are available means. The material can be and has been used as a soil conditioner. Proper publicity as to the availability of the material has resulted in farmers and citizens transporting all the cut material away from the site of deposit in harvesting programs in other areas (Langford, R. Lecture presented at University of Washington lake management seminar, ENVS-520, 1979). Composting is also possible and has been successfully done by groups in the Seattle area. Likewise, biomass conversion is reported to be feasible and to have been done by groups in the Seattle

area to produce methane for energy (Personal communication with representatives of Greenpeace, 1979). Available information on cost indicates mechanical harvesting to be far superior to the use of herbicides, with 2,4-D and dipotassium endothall as the least costly herbicides available for aquatic application. Reported costs in the literature for mechanical harvesting in the past have been quite low, ranging from $50 to $140 USA/ha (approximately $20 to $57/acre) (Dunst, R.C., et al. Survey of lake rehabilitation techniques and experiences. Technical Bulletin No. 75, Wisconsin Department of Natural Resources, Madison, p. 21, 1974). The Aquamarine Corporation, a manufacturer of mechanical harvesters in Wisconsin, estimates that (Letter of 14 November 1978 from T.A. Rathkamp of Aquamarine, Waukesha, Wisconsin to me, 3 pp.):

"Harvesting can be done on a cost effective basis from approximately $60 - 150 per acre."

Aqua Science Consulting of Victoria, B.C. estimates the costs for mechanical harvesting at this time in this area to be in the range of $100 to $200 per acre (Langford, 1979 as referenced on page 17 of these comments). The sanitary district in Walworth County, Wisconsin mechanically harvests 130 acres on Lake Beulah during the period from 1 June to 1 September each year. The area is harvested twice per season for a total of 260 acres of harvest with Aqua-Trio equipment purchased in 1971. Actual operating expenses in fiscal year 1976 were $18,174.22 for amortization of machinery (final payment) and operating expenses and salaries of two personnel. That works out to a cost of approximately $70 per acre for the two harvests or $140 per acre for the actual areal extent of the area harvested in the lake (i.e., treated). According to Mr. Bergenthal of the sanitary district (Weed harvesting saves a lake, reprinted from the July 1973 issue of The American City and Byrnes, J.W.; G.L. Dorn; and C. Bergenthal. Sanitary district report, fiscal 1976. 4 pp.):

"After much experience with herbicides, we concluded that poisoning weeds really only put them on the bottom where they consumed oxygen while rotting. The accelerated generation of muck and weed regrowth was a dead end effort destined only to end in bog removal and dredging. We chose to prevent this expense."

The Water Resources Branch of the Ontario Ministry of the Environment conducts an annual harvesting program on 880 acres of Chemung and Buckhorn Lakes in Ontario, Canada. Expenses reported for this program in 1978 were $133,980 (Canadian) or $152.25 Canadian/acre (Letter of I. Wile of the Water Resources Branch of 13 March 1979 to J. Lewis, SOEC, Penticton, B.C.). Since the Canadian dollar is worth less than the United States dollar, the actual expense would be somewhat less. Furthermore, this program is obviously one which covers a large acreage compared to the proposed Lake Washington herbicide application and effectively refutes the unsubstantiated con- contention that mechanical harvesting is too slow to cover large areas. The draft EIS also fails to provide cost figures for herbicide applications. At the 10 April 1979 public hearing, Mr. Jim Ely of A-1 Spray Services, Inc. refused to be pinned down to a guaranteed estimate on the excuse that he has not yet negotiated a firm contract with the sponsors of this proposed action, whoever they are. However, in response to questions he did indicate that a ballpark figure for either 2,4-D or endothall in this case was $300 per acre. Obviously, these figures indicate that herbicides are much more expensive per acre for this proposed action than mechanical harvesting would be likely to be. All mechanical harvesting estimates presented above were less than $200 per acre. The ballpark figure would appear to be that herbicide use for

this proposed action would be on the order of at least 50 percent more expensive than mechanical harvesting. For an area the size of 175 acres the figures would be:

Herbicide Application (estimated maximum of $300/acre) -	$52,500
Mechanical Harvesting (estimated maximum of $200/acre) -	$35,000
Excessive cost of herbicide use -	$17,500

Habitat maniuplation via the use of a synthetic material known as "Aquascreen" has shown great promise in Metro's aquatic plant study. According to Dr. Perkins of the University of Washington (Personal communication, 1979):

"Preliminary results of the Aquascreen application were considerd highly successful in controlling milfoil growths."

Like mechanical harvesters, it appears that Aquascreen may have a long service time (on the order of 10 to 15 years) so that amortization of high initial costs for the material (estimated at approximately $6,000 per acre) over the period of use makes it appear that this alternative <u>is</u> cost competitive with other alternatives and may be particularly useful for limited acreage sites in congested areas such as around boat moorages. Used in combination with mechanical harvesting, these alternatives would apparently readily satisfy all known needs. The draft EIS ignores that combination alternative.

The no action alternative is interesting to contemplate in terms of the dynamics of aquatic plant growth. Although little is known regarding this topic, there is some knowledge regarding Eurasian watermilfoil in general and aquatic plants in the Seattle area. Sufficient information is known to indicate that the limited information presented in the draft EIS is incorrect and/or misleading and therefore is a disservice to the public by repeating misinformation and unsubstantiated allegations. In the draft EIS the no action alternative is discussed on page 17. Although it is acknowledged that Eurasian watermilfoil has "in many areas" grown rapidly and spread and then suffered dieback to achieve some degree of balance the draft EIS estimates that this might take "from 13 to 20 years" to occur. The available information would indicate a much shorter time frame, on the order of the 6 to 10 year period which was seen in the Chesapeake Bay situation referred to on page 17. For example:

1. Carpenter, S.R. (1979). Changes in macrophyte community structure and biomass in Lake Wingra, 1969-1978. Conference on The Efficacy of Intensive Plant Harvesting in Lake Management, Madison, Wisconsin, pp. 57-90 of pre-conference draft.

"The recent course of change in the macrophyte communities of Lake Wingra has been dominated by the dynamics of one exotic species. After a decade of abundance, Eurasian water milfoil seems to have undergone a sustained decline in the Madison lakes. A pattern of explosive growth followed by declining abundance may describe most milfoil invasions... by 1966 Eurasian water milfoil was a prominent member of the Madison lakes' flora... Eurasion water milfoil formed dense beds throughout the shallow areas of the Madison lakes for about 10 years, from the mid- 1960's to the mid-1970's. Then, around 1974-1975, the biomass of the milfoil stands inexplicably began to decline."

2. Wile, I.; G. Hitchin; and G. Beggs. (1979). Impact of mechanical harvesting on Chemung Lake. Same conference as above, pre-conference draft, 17 pp.

From the start of the study in 1971 (Eurasian watermilfoil had been present for several years by that time) "Eurasian watermilfoil, Myriophyllum spicatum L. biomass increased gradually until 1976 and subsequently declined rapidly."

Additional relevant information specific to the Seattle area is contained in the 1978 Metro publication Distribution and Community Composition of Macrophytes in Selected Waters of King County, by Goodpasture, J.M., J.I. Davis, and R.I. Matsuda, 133 pp. According to that document there have been fluctuations of plants in area lakes due to both natural factors and control efforts by people. For the lakes or bodies of water surveyed the results were as follows:

1. Plant communities increased in ten of the waters (including part of Lake Washington;

2. Plant communities decreased in fifteen of the waters (including Union Bay) of which four are thought to be the result of herbicide use; and

3. Plant communities remained pretty much unchanged in seven bodies of water (including parts of Lake Washington, double counted herein).

With specific regard to Eurasian watermilfoil, reportedly only present in eleven of the thirty-one bodies of water surveyed (pre-selection of these bodies of water was biased by attempting to select bodies of water thought to contain Eurasian watermilfoil):

1. Eurasian watermilfoil increased in six of the waters (including parts of Lake Washington); and

2. Eurasian watermilfoil decreased in five of the waters (including Union Bay).

With specific regard to waters included within the scope of the draft EIS, no information was provided regarding the west side of Mercer Island; however, for the other sites:

1. Union Bay - decrease both from apparent illegal use of herbicides and unknown factors (possibly natural);

2. Fairweather Bay - Possible decrease;
3. Cozy Cove - Possible increase; and
4. Yarrow Bay - No change.

} For Potamogeton sp. and Watermilfoil

It can be concluded from the above information, as well as the previous year's work which reported similar findings that Eurasian watermilfoil is not rapidly expanding, but is in fact both decreasing and increasing in a manner not unlike other aquatic plants in the area and, on balance, may be slightly declining. Neither does the habitat situation and geography of this area make spread of Eurasian watermilfoil by plant fragments a question of serious concern. Eurasian watermilfoil is already widely distributed and natural fragmentation has essentially already impacted all naturally connected waters from Lake Sammamish to Puget Sound. Therefore, mechanical harvesting will not have any negative effects with regard to the spread of Eurasian watermilfoil, as alleged by some, and in fact is more likely to decrease grow back and thereby decrease

the extent of plant growth (an example of the references which support this contention would be Carpenter, 1979 as referenced on page 19 of these comments).

On page 18 of the draft EIS there is mention of on-going studies under the direction of Metro and the COE. In both cases, decision making material and information from these studies will not be completed and released to the public in final form until late in 1979. Both of these studies are far superior to any investigations which have been conducted by the DOE or whoever the sponsors of this proposed action are as indicated by the very poor quality of the draft EIS. In fact, DOE is partially financing the Metro study and the proposed action would adversely impact that study by interfering with work in the research area that is presently planned. It is highly inappropriate to even be considering such premature action as is proposed in the draft EIS prior to the completion of the Metro and COE work and the availability of that information for informed and rational decision making with full public participation.

The final statement on page 18 of the draft EIS indicates that at least a partial justification for the proposed herbicide application is to reduce the possibility of "unauthorized herbicide applications" as occurred in Union Bay last year, apparently. Such justification amounts to little more than opening up the public treasury (in the form of the value of the aquatic environment and public health) to persons unknown who have so little regard for the environment and public health and the law that they might otherwise rob the bank. It makes far better sense to ensure that actions are taken to enforce the applicable laws rather than waiving them. The Washington Department of Agriculture has taken steps in the right direction by proposing to classify all aquatic herbicides as restricted use pesticides.

Sections VII and VIII on page 19 of the draft EIS need revision to improve them so that they reflect the information presented herein.

In summary, our analysis of the draft EIS indicates the following:

1. The draft EIS does not comply with the requirements of the SEPA;

2. It appears that the DOE has performed a highly biased analysis and selected outcomes prior to preparation of the draft EIS;

3. The draft EIS is totally inadequate as a decision making document since relevant information is not presented and it consists largely of a collection of unsubstantiated opinion which is counter to the available facts; and

4. The alternatives are not fairly presented in an understandable and comparitive manner which would allow the reviewer to understand the full range of options. Substantial information on some of the alternatives is totally missing and in other cases is presented in so misleading a manner as to be essentially false.

Due to the inadequacy of the process to date, we recommend that the proposed action either be completely rejected at this time or that the draft EIS be re-written as a draft EIS and be again distributed to the public for comment as a draft only with wider distribution and adequate review time and a public hearing on the Seattle side of Lake Washington, as previously requested. We hereby request full and complete copies of all comments received on this draft EIS submitted by the following agencies:

1. EPA;
2. COE;

3. Metro;
4. City of Seattle;
5. City of Mercer Island;
6. City of Medina;
7. City of Kirkland;
8. King County;
9. Washington Department of Fisheries (DOF); and
10. Washington Department of Game (DOG).

We note that the DOF is already on record as being opposed to such herbicide applications in Union Bay as proposed here, due to possible adverse effects on salmon migrations. Salmon would be expected to be present in Lake Washington in June, the time of the proposed action. (Letter of G. Sandison of 29 July 1977 to J. Spencer of the DOE applies and, of course, was not mentioned in the draft EIS even though it is highly relevant, as followup correspondence would also be).

A final comment is necessary with regard to the failure of the DOE to have specified any environmental monitoring conditions in the draft EIS. Without information on existing conditions, the DOE would propose to allow the use of toxic substances in Lake Washington without any monitoring program. That is typical of the lack of good planning, lack of environmental sensitivity, and lack of regard for its responsibilities to the public that the DOE has demonstrated with this draft EIS to date.

We will look forward to receiving notification from you of your intentions in this matter and your response in detail to our comments (including any future drafts of impact statements on this topic). Thank you for your consideration and timely response.

Sincerely yours,

GM Zemansky

G.M. Zemansky

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
REGIONAL OFFICE
ARCADE PLAZA BUILDING, 1321 SECOND AVENUE
SEATTLE, WASHINGTON 98101

August 15, 1979

REGION X

IN REPLY REFER TO: 10C

Office of Community Planning
& Development

Maxey B. Carpenter, Jr.
Lt. Colonel, Corps of Engineers
Acting District Engineer
Department of the Army
P.O. Box C-3755
Seattle, Washington 98124

Dear Lt. Colonel Carpenter:

Re: Draft Environmental Impact Statement
Aquatic Plant Management Program
State of Washington

We have reviewed the impact statement submitted with your July 16, 1979 letter.

Your proposed action is to implement control measures for certain waters in the State of Washington that are infested with Eurasian watermilfoil.

We concur with the need for control measures, however, the method to be employed is not within our expertise. Thus, we have no constructive comments to offer.

Thank you for the opportunity to comment.

Sincerely,

Robert C. Scalia
Director
Regional Office of CPD

cc: Richard Moore/HUD-SAO
Ed Moger/HUD-SAO

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August 20, 1979

Department of the Army
Seattle District Corps of Engineers
P. O. Box C-3755
Seattle, WA 98124

Attention: Lt. Col. M. B. Carpenter, Jr.

Gentlemen:

Thank you for the copy of the draft Environmental Impact Statement entitled "Aquatic Plant Management Program - State of Washington," and the chances to review it. Following are our comments which will be restricted to endothall:

Page 1, Paragraph 2

"The primary control methods would be chemical harvesting and 2,4-D application."

> Endothall is mentioned under "other treatments." This is very surprising since, in the past in other areas of the U.S. as well as in the Northwest, endothall was considered the preferred material for the control of milfoil based on its activity, amount of toxicology information, fate in the environment, etc. as well as enocomics.

Page 13, Section 1.04.5.2

> It is incorrect that endothall "does not affect plant roots." Endothall is not translocated to plant roots but indirectly roots are affected and there is no evidence that regrowth of a plant treated with endothall will occur sooner than those treated with 2,4-D.

". . . . would kill many native species . . ."

> No chemical is selective to milfoil only. Among 12 plant species mentioned on page 40 under Section 2.02.7.1 occuring in Lake Washington, endothall will control only four species.

". . . . would kill many terrestrial species . . ."

> At concentrations of approximately 2 ppm of endothall

at the time of treatment (which would decrease to a fraction of a ppm within a day or two) endothall will not affect terrestrial plants.

Page 16. Section 1.05.1 through Section 1.06.3 (pages 24 through 30)

Endothall is mentioned as possible treatment in only three areas. The same pertains to proposed treatments in other areas.

Page 47. Section 3.05.2

After the five-day hearing, the State Pollution Control Hearing Board affirmed previous DOE decision to allow the use of Aquathol® "K" Aquatic Herbicide in Lake Washington.

Page 53. Section 4.04.5.2

It is true that weeds mentioned herewith may be killed by the use of endothall. However, only a few of these occur in Lake Washington. Besides thatm there are others which will not be affected (Elodea, Chara, Juncas, Nuphar, Nymphaea, Typha, Nitella).

Present Aquathol K label restrictions do state that treated water cannot be used for irrigation within seven days of treatment. However, this restriction was based on insufficient amount of data in support of registration of AQUATHOL "K" number of years ago. Based on data collected since that time a label, now pending in Washington, D. C. waiting for their registration, does not have any restrictions regarding use oftreated water on crops, for domestic purposes, for drinking, etc. The reason we are mentioning this is that, hopefully, by the time of additional treatments a new label will be issued.

Page 55. Section 4.05.2

See previously made comments.

Page 60. Section 4.15

In accordance with our comments under Section 4.04.5.2, Proposed label will not bear any restrictions regarding fishing and swimming.

Page 62. Section 5.05

Based on many years of experience with endothall as well as other chemicals, if properly used kill of fish will not result; especially, since total body

of water is not treated.

<u>Page 70, Section 7.01.2</u>

Chemical control of aquatic weeds endothall does not have any long-lasting impact on water quality due to persistence of chemical since it lasts only for a couple of days in insignificant amounts. Also, it will not impact the long-term productivity of the water body since chemical residues do not accumulate in the sediment.

<u>Page A-7</u>

$LC50_s$ referred to endothall acid which is not correct. Toxicity information pertains to potassium or sodium salts of endothall.

<u>Page BB-5</u>

Pimentai, D., 1971

This report is a poorly done EPA summary, is not complete, and it can be misleading.

In general, we believe that the Corps of Engineers do not give enough consideration to use of endothall. It is equally effective as 2,4-D for the control of milfoil and, at the same time, considerable more favorable information is available pertaining to toxicity, expecially long-term, as well as impact on the environment. This was very evident during above mentioned hearings by the State Pollution Control Board Hearing. The same pertains to toxicity to fish and wildlife.

Very truly yours,

Obren Keckemet

Obren Keckemet, Director
Research & Development
Agchem Division

OK:mc

August 20, 1979

Robert M. Rawson
Environmental Resources Section
Seattle District, Corps of Engineers
P.O. Box C-3755
Seattle, WA 98124

Dear Mr. Rawson :

Thank you for providing me with the Corps' definition of navigable waters in response to my letter of July 27, 1979 and for informing me of the extension of the public comment period for the Aquatic Plant Management DEIS.

When the Design Memorandum becomes available for public review (hopefully prior to September 14, 1979) I would greatly appreciate recieving a copy since a complete and proper review of the DEIS is not possible without it.

Sincerely,

Michael McPhail

Michael McPhail
4905 Woodland Pk Ave N #3
Seattle, WA 98103

CITY OF BELLEVUE • 655 120th Ave. N.E., Post Office Box 1768 • Bellevue, Washington • 98009
Office of Environmental Coordinator

August 23, 1979

Maxby D. Carpenter, Jr.
Lt. Colonel, Corps of Engineers
Acting District Supervisor
Seattle, WA 98124

Dear Col. Carpenter,

The City of Bellevue's Office of Environmental Coordination has reviewed the DEIS for the aquatic plant management program. Our comments are as follows:

The DEIS fails to address the disagreement over whether or not a milfoil control program should be pursued. The appendix of the DEIS contains a letter from Charles Chambers of the Fish and Wildlife Service which states (on p. B-18) that, "There is a wide difference of professional opinion on the need to control milfoil." Since the time of Mr. Chamber's letter, the Corps Waterways Experiment Station has further progressed with, if not completed, its projections of potential milfoil infestation areas (see p. 11). Of necessity, this study relied on certain assumptions. Are the conclusions of this study and of the DEIS's analysis of no-action impacts widely accepted? Specifically, how contested is the conclusion that without a control program milfoil would spread to a maximum within probably 5 years (see p. 68)? Any doubts as to the necessity and desirability of milfoil control should be discussed in the EIS.

The DEIS outlines the proposed treatment areas for 1980. Since none of the possible control methods would completely eradicate milfoil and some of the proposed methods (e.g. mechanical harvesting) do not even kill milfoil, is it anticipated that the areas treated in 1980 would need to be treated indefinitely over subsequent years? Does the aquatic plant management program have a specific time frame? If mechanical harvesting or chemical control occurs for one year only, for how long would the different treatments be effective; how much would the milfoil population of the year following treatment be reduced from the pre-treatment level? The EIS should discuss these questions as part of the general project description.

The impacts of chemical control (particularly of 2,4-D control) need to be further explored. To date, is there any data on the effects of 2,4-D on the juvenile stages of fish and other wildlife? (Juveniles may be much more susceptible than adults.) What age distribution of test animals was used to generate the data in Tables 1 and 2 (appendix A)?

Tables 1 and 2 provide data on acute toxicity only. What evidence is there of toxicity which is less than acute? If the control program is to be administered over a number of years (which it must in order to insure continued control),

then it becomes particularly critical to know the long-term impacts of low level herbicide levels. The DEIS states (on p. A-2) that "The long-term impacts of low concentrations of 2,4-D in aquatic systems is not known. Our literature review and review of ongoing programs has not indicated that there would be serious problems". What has the literature review uncovered? What problems were uncovered that were not deemed "serious". Has the review uncovered actual evidence that no potential problems exist or is the absence of documented problems an indication of scanty data?

Another area of concern is the possible effects of 2,4-D on human health. The DEIS notes that "Much of the opposition to the use of 2,4-D is based on the belief that it can cause cancer and birth defects" (p.A-2). The DEIS states further that "Many scientific studies have been done but the results so far have been inconclusive. The U. S. Environmental Protection Agency . . . has stated that the continued use of 2,4-D is not imminently hazardous to the environment." In light of the controversy over human health impacts, the DEIS should not dismiss so readily the health issue. What evidence exists which demonstrates the safety or potential health hazard of 2,4-D? Does 2,4-D accumulate in the human body? (Further, does 2,4-D break down into a more toxic form before it breaks down into non-toxic ones?)

Thank you for the opportunity to comment on the draft EIS.

Bellevue's Office of Environmental Coordination would also like to offer the following suggestion: If the public awareness program is implemented, the public should be informed of the hazards of unregulated herbicide use as well as of the problems of milfoil itself. As Charles Chambers points out (p.B-19), " . . . perhaps the greatest threat to fish and wildlife from milfoil is the uncontrolled citizen use of herbicides . . ."

Sincerely,

Nancy Tucker

Nancy Tucker
Environmental Planner

NT:mcp

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
CENTER FOR DISEASE CONTROL
ATLANTA, GEORGIA 30333

August 27, 1979

Lieutenant Colonel Maxey B. Carpenter, Jr.
U.S. Army Engineer District, Seattle
P.O. Box C-3755
Seattle, Washington 98124

Dear Colonel Carpenter:

We have reviewed the Draft Environmental Impact Statement (EIS) for the Aquatic Plant Management Program, State of Washington. We are responding on behalf of the Public Health Service and are offering the following comments for your use in preparing the final environmental impact statement.

We understand that the proposed program will manage the introduced aquatic plant, Eurasian watermilfoil, in portions of Lakes Washington, Sammamish, and Union and in the Okanogan River and Osoyoos Lake. We have some concerns about the use of chemical controls and their effect on nontarget organisms.

Chemical Controls

While some information was submitted on the potential effects of 2,4-D, we believe additional information is required on the environmental and possible health effects of the other control chemicals. Bioassays on acute and chronic effects of each of the control chemicals should be performed on various life stages of local nontarget organisms, particularly organisms consumed by humans. Monitoring during the actual management program to determine possible adverse effects may be appropriate.

A more complete explanation should be given as to why endothall, diquat, and casoron have to be used in the King County Log Boom Park area and the Juanita Beach County Park area of Lake Washington, and the Washington State Park area of Lake Sammamish. If complete vegetative removal is required for the immediate park area where high use areas and/or swimming beaches exist, we believe that the "primary control methods" of mechanical harvesting and 2,4-D application should suffice. Where necessary, they could be supplemented with bottom shading, hand removal, diver-operated dredge, and gravel or sand blankets--which may be required anyway.

Water Quality

It has been our experience that aquatic vegetation can both improve and degrade water quality. Water quality can be improved from the uptake of nutrients by aquatic vegetation. According to the EIS, the project lakes

are affected by: sewage overflows, municipal sanitary wastes, other point discharges, land management practices, and septic tank leachate from extensive shore property development. It appears that the high nutrient concentrations from these pollution sources are partly responsible for supporting the "lush populations of aquatic vegetation," including milfoil. The water quality benefits--such as providing a nutrient sink--of these aquatic plant populations should be noted. In addition, the benefits of milfoil and other aquatic plants in preventing shore erosion by providing a wave buffer should be addressed.

The decomposition of large populations of milfoil or any aquatic vegetation may also degrade water quality. The EIS indicates that milfoil adversely affects dissolved oxygen concentrations, reduces benthic invertebrates and possibly causes fish kills. Have any fish kills ever been reported that were caused by milfoil, its nighttime respiration, or its natural decomposition? According to the EIS, the Fish and Wildlife Service has not been able to document any adverse effects of milfoil on either fish or wildlife. Instead, there is more concern with the threat that the control chemicals may have upon fish and wildlife. Casoron treatments--though probably uncontrolled--have already resulted in one reported fish kill in Lake Washington.

The effects that power boats have had in fragmenting and spreading milfoil should also be discussed.

Water Supply

A description should be made of local water supplies and the distance of any intake structures to the proposed management areas. Possible effects upon intake quality and any groundwater recharge areas in the project lakes should be carefully addressed.

Disposal

The EIS fails to discuss how the harvested milfoil will be disposed. Considering its "high percentage of crude protein," local farmers may be willing to use it for supplemental feed as long as it is chemically untreated and readily accessible before being allowed to decompose.

Vectors

We believe the EIS should discuss the extent to which milfoil infestation has increased mosquito populations in the project areas. Furthermore, the significance of the problems associated with mosquito breeding in the lush stands of aquatic vegetation should be addressed. Considering the percentage of the infested lake areas to be treated, any benefit from the reduction of potential mosquito breeding areas should be placed into proper perspective.

Thank you for the opportunity to review this Draft EIS. We would appreciate receiving a copy of the final statement when it becomes available.

Sincerely yours,

Frank S. Lisella

Frank S. Lisella, Ph.D.
Chief, Environmental Affairs Group
Environmental Health Services Division
Bureau of State Services

AQUATIC CONTROL

AQUATIC · INDUSTRIAL · RESIDENTIAL
VEGETATION MANAGEMENT SPECIALIST

August 28, 2979

Mr. Bob Rawson, Biologist
U.S. Army Corps of Engineers
Seattle, WA 98104

Dear Mr. Rawson:

Re: Draft Enviromental Impact Statement for the Aquatic Plant Management Program in Washington state.

The basic concept of the draft EIS is good. That is control of the milfoil. However, the areas outlined in the draft EIS are only those of a high use nature. Failure to make substantial control efforts in other areas-i.e. all of Union Bay, Lake Sammamish (including the outlet river to Lake Washington), Lake Forest Park-Kenmore, Juanita Bay, Yarrow Bay, Co„y Cove, Mercer Island,etc.- will result in continued fragmentation of the milfoil and the subsiquent spreading of the plant.

Another area which did not receive much attention was that of lake quality monitoring. Should herbicides be used in Lake Washington, a substantial monitoring program should be implemented. This, information would or could be used when designing lake management programs in future.

Sincerely,

James H. Carsner
James H. Carsner
Aqua · Biologist

19104 · 29th AVE. E. TACOMA, WA. 98445 847-6058

STATE OF WASHINGTON
Dixy Lee Ray
Governor

OFFICE OF ARCHAEOLOGY AND HISTORIC PRESERVATION
111 West Twenty-First Avenue, Olympia, Washington 98504 206/753-4011

August 28, 1979

Maxey B. Carpenter, Jr.
Lt.Colonel Corps of Engineers
Acting District Engineer
P.O. Box C-3755
Seattle, WA 98124

In reply refer to: 62-F-COE-S-12

Re: Aquatic Plant Management Program

Dear Applicant:

We have reviewed your draft environmental impact statement and find there are no historic/archaeological properties on the State or National Register of Historic Places, or the Washington State Inventory of Historic Places, that will be impacted by the project.

In the event that activities are proposed which may affect known or unknown archaeological resources please notify the Office of Archaeology and HIstoric Preservation in Olympia.

Sincerely,

JEANNE M. WELCH, Deputy State
Historic Preservation Officer

Sheila A. Stump, Archaeologist

lre

August 29-79

TO: Maxey B. Carpenter, Jr
Lt. Colonel, Corps of Engineers
Acting District Engineer
Department of the Army, P.O. Box C-3755
Seattle, WA 98124

Dear Col. Carpenter

I am writing in response to your Draft Environmental Impact Statement - "Aquatic Plant Management Program - State of Washington." of July 1979

My family has an interest in property on a lake in King County and I own a tract of lakefront property in Pierce County. My concern is that of a citizen who is becoming alarmed at the efforts to block the control of Eurasian watermilfoil by chemical application — the most cost-effective and time tested method known. I strongly support your program to control Eurasian watermilfoil. I want to use my lakefront for swimming and recreation.

I do not favor expenditure of public funds on costly and impractical ideas such as mechanical harvesting or bottom shading with aquascreen. Many lakes in Washington have been treated chemically for more than twenty years successfully. Why abandon the proven methods because of some emotional speculation about chemicals?

Howard W. Millan
2410 Berry Lane E, Tacoma, WA 98424

Office Of The Mayor
City of Seattle

Charles Royer, Mayor

August 29, 1979

Mr. Robert Rawson
Department of the Army
Seattle District Corps of Engineers
P.O. Box C-3755
Seattle, Washington 98124

Dear Mr. Rawson:

I appreciate the opportunity you have given the City of Seattle to extend comments on the Draft Environmental Impact Statement for the Aquatic Plant Management Program.

The Department of Community Development has the general responsibility for coordinating these comments for the City of Seattle. I am enclosing a copy of the response developed by the Department.

Sincerely,

Charles Royer

Charles Royer

CR/dhp

Enclosure

Your
Seattle
Community Development

Darel Grothaus, Director
Charles Royer, Mayor

August 29, 1979

The Honorable Charles Royer
Mayor
City of Seattle

Dear Mayor Royer:

The Department of Community Development has completed its review of the Draft Environmental Impact Statement prepared by the Corps of Engineers for the Aquatic Plant Management Program. The comments presented below reflect the concerns of the Office of Intergovernmental Relations, the Parks and Recreation Department, and the Water Department, as well as our own.

General Comments

The Corps of Engineers proposes that it pay 70% of the control program. The methods for control are stated to be determined in cooperation with local governments. The City agrees with the proposal of the Federal agency to cover 70% of the costs of whatever combination of measures the local government selects. We are concerned that given the tenor of the Draft EIS that the Corps will only cover the costs for a chemical control program. Such an action would force local governments in the direction of chemical application even though other methods may be more desirable for both ecologic and economic reasons.

This summer the Department of Parks and Recreation has installed polyvinyl-chloride-control coated fiberglass screens to inhibit milfoil growth at four public beaches, two of these beaches being Madrona Park and Seward Park on Lake Washington. The Department has also purchased screening material for installation at Mt. Baker next summer. The Department of Parks and Recreation also desires to eventually purchase material for Madison and Pritchard Island beaches as well as for the Leschi and Lakewood Moorages. The installed screens would be removed and stored at the end of the swimming season and would be re-installed every summer thereafter. Therefore, the City's actions have already begun control activities at two of the three Lake Washington beaches proposed for treatment by the Corps. Pritchard Island remains an area proposed for control by both agencies. If the Corps were to assume responsibility for Pritchard and were willing to substitute two other locations for those already treated, then the City and the Corps could cooperatively treat all of the areas targeted without either having to bear the full costs

...ler B'dg., 400 Yesler Way, Seattle, Washington 98104 (206) 625-4537

of control. This assumes that the Corps would agree to use a method of control acceptable to the City of Seattle.

The Water Department has the responsibility for supplying the Seattle Metropolitan area with drinking water. Water supply sources are located in the Cedar River and South Fork Tolt River Watersheds. There are areas within the Cedar River Watershed and the reservoir system (Lake Youngs) that are susceptible to infestation by milfoil. Fragments transported by water fowl would be the most likely method of infestation. A heavy vegetation growth, characteristic of milfoil, would markedly increase the eutrophication process occuring in the lakes and could add taste and odor problems to the water supply. The decomposing plants increase the concentration of dissolved organic substances which can react with chlorine during water treatment to form minute amounts of substances which might be carcinogenic. For these reasons we would wish to avoid milfoil infestation into the watershed if at all possible. Protection of the watershed areas may be considered as areas for treatment in lieu of the sites already being controlled by the Parks and Recreation Department.

We suggest that the Corps of Engineers consider adding a patrol in the Lake Washington system to pick up the large masses of free floating milfoil which clutter the docks and moorages. We believe that such a patrol, with an adequate pick-up vessel, should help reduce the rate of infestation.

We are concerned that the Corps will finalize this EIS before the results of the METRO sponsored Union Bay research project are completed. The METRO project could provide some relevant data for choosing the best combination of control methods. It will also add some current cost-benefit data. We thereby urge that the Final EIS should incorporate the results of the METRO study.

In order to identify any restrictions or constraints which must be followed in the implementation of the control methods, the Final EIS should thoroughly discuss and define what "proper application" procedures entail. This is particularly necessary for the chemical treatment alternative.

Page B-10 of the apendices mentions the use of copper sulfate but the Draft EIS does not include it in the chemical control methods. The Final EIS should explain why copper sulfate was not included in the methods for chemical control.

Specific Comments

Section 1.04 should be limited to a description of each of the methods and an objective assessment of its effectiveness and limitations in controlling milfoil. This section, as presently written, seems to assume that herbicides are the best control method and makes general statements concerning costs of the other alternatives. We believe that if these comparisons are to be made in the EIS, then they should be made in quantitative terms with the best current data.

Section 1.04.6 The paragraph concerning Bottom Shading states that screens are justified only for high use areas. Since the scope of the proposed control program is limited to high use areas the fact that shading would eliminate all growth rather than just milfoil should not be a drawback to its use in the control program as stated in this section.

Section 1.05 The discussion contained in this section mentions that local jurisdictions must submit their proposed areas for treatment to the State Department of Ecology for inclusion in the total state proposal. We suggest that the Corps of Engineers explain how the areas proposed for control listed in the Draft EIS were selected for the proposal prior to the submittal of areas for the treatment by local agencies. Such a discussion should explain any agreements made by local agencies prior to the issuance of the Draft EIS.

Section 1.05.4 We suggest that the cost/benefit analysis discussion be expanded substantially to allow an evaluation of the various alternative methods of control. The estimate of benefits seems to be based upon what a few property owners are willing to pay for the "most likely least cost alternative," namely herbicide application. Since that method was the most readily available and convenient as well as the cheapest, the fact that, without chemicals being allowed, property owners may have been willing to pay more for different approaches to milfoil control seems to have been overlooked. Though the difference cannot be easily quantified, it should be acknowledged qualitatively in the Final EIS.

Any comparison of costs between alternative control methods should be done on an annualized basis. For example, if chemical treatment is necessary each year and bottom shading is effective for several years, or a portion of its costs counts toward more than one year, then this must be taken into account in the cost comparisons. Further, because 2,4-D is reported to also kill roots, a study should be initiated to determine if such treatment extends the control period and eliminates the necessity of annual or semi-annual harvesting. A determination of this type could alter the cost-benefit analysis if calculated on an annual basis.

The present assessment of costs, given as $144,000 for a combination of the proposed methods, seems to indicate nothing other than direct costs for application of the proposed methods. The analysis should recognize that indirect costs may be involved with usage of a particular control method. For example, the use of herbicides and harvesting may result in lowered dissolved oxygen levels which may kill some of the fish population. Any chemical hazards to the fish population must involve some cost to the public. Although we recognize that these costs are difficult to quantify, we feel that they should be at least qualitatively assessed and discussed in the Final EIS.

We suggest that the Final EIS include a cost breakdown for each method or combination of methods so that a better evaluation of comparative costs and benefits may be made. The analysis should be arranged in a manner where several control methods can be evaluated and it should contain the basic elements essential to explain the cost/benefit ratio.

Section 1.07.2 mentions that granular herbicides would be used in areas where drift would be a problem. Though the granular form of herbicide would dissolve slowly and release its chemicals at a slower rate, there may still be problems with the dissolved herbicides' susceptibility to drift. This problem should be discussed in the Final EIS.

Section 3.04 mentions that the proposal is in compliance with local land use policies. The Final EIS should substantiate this statement with regard to agreements with local agencies concerning their land use policies. It would seem difficult to determine any compliance with some land use policies when the areas and methods for treatment have not yet been finalized.

Section 4.03.5 states that high concentrations of herbicides would not remain in the water for very long periods of time. An explanation of what comprises a low or high concentration and information regarding how long low concentrations of herbicides would remain in the water column should be contained in the Final EIS.

Section 4.06.5 discusses Chemical Control. The discussion contained in this section leaves many questions which we feel should be answered in the Final EIS. These questions include: What amounts of chemicals will be applied per acre? What will the resultant concentrations of chemicals be in the receiving waters? Will these concentrations vary with time and how do these variations compare with the acute toxicity levels listed in Appendix A? What time of the year would the chemicals be applied and which species of fish are apt to be present?

Section 4.08.3 mentions that Endothall, Casoron and Diaquat have not been indicated to be injurious to public health at the concentrations used for plant control. Noting the discussion in section 4.08.2 which states, "The results of these studies have in some cases been contradictory and by no means are conclusive," we feel that claim should be substantiated. Further, the Final EIS should discuss whether any studies have been made concerning the long term, cumulative effects of exposure to low dosages of herbicides. It would seem appropriate to state what the possible cumulative effects of long term low dosages will be since the proposal involves annual treatment of control areas. In addition, some mention should be made regarding long term effects on the food chain since section 4.09 states that there would be no effect upon any endangered species in the treatment areas.

We note that Appendix A contains no information regarding the acute toxicity level to salmonids. Since salmonids may be the most valuable and sensitive species affected, this lack of information should be corrected in the Final EIS. If the levels are unknown, then the risks associated with herbicide application should be listed as a possible cost of chemical usage. Appendix A also discusses Biological Accumulation. The discussion as presented in the Draft EIS seems of little value since it mentions that "some" organisms accumulate 2,4-5, and "some" organisms rapidly cleanse themselves of chemicals when introduced to clean water. We suggest that the Final EIS discuss this subject further and more specifically point out the effects on biological accumulation.

Finally, we note that Fisheries Agencies have expressed their reservations concerning the use of chemicals in relationship to the impact on the fishery population. For example, the State Department of Fisheries indicated that "they cannot support use of 2,4-D to treat milfoil when salmon are present... until we have seen data on the affects of the specific chemical proposed for use on different types of salmon, i.e., both fry and fingerlings." (Reference letter, page B-15). The Department of Fisheries also noted that any applications of 2,4-D should only be done in August when salmonid populations are lowest. The Department of the Interior recommended that "bioassays should be conducted on various life stages of non-target organisms" if chemical methods are used. The Draft EIS makes no mention of time restrictions for chemical application, nor does it mention bioassays. We suggest that the Final EIS discuss both of these issues in some detail.

We appreciate the opportunity to review this document. If you have any questions regarding our comments please do not hesitate to contact Larry Schmeiser, Director of this Department's Environmental Management Division.

Sincerely,

Darel E. Grothaus

Darel E. Grothaus
Director

DG/DH/sp

cc: Office of Intergovernmental Relations
Parks and Recreation Department
Water Department

4200 95th NE
BELLEVUE, WASH
98004

ROBERT RAWSON
DEPT OF ARMY
CORP OF ENGINEERS
P.O. BOX C-3755
SEATTLE, WASH 98124

AUGUST 30, 1979

RE: AQUATIC PLANT MANAGEMENT PROGRAM

I AM A RESIDENT OF YARROW POINT WHO BECAME INTERESTED IN THE MILFOIL PROBLEM BECAUSE I OWN WATERFRONT PROPERTY AND FREQUENTLY USE LAKE WASHINGTON FOR RECREATIONAL PURPOSES. I ACTIVELY SUPPORTED THE MILFOIL TREATMENT PROGRAM CONDUCTED IN LAKE WASHINGTON BY A-1 SPRAY SERVICES IN THE SUMMER OF 1979.

I HAVE REVIEWED THE DEIS FOR THE AQUATIC PLANT MANAGEMENT PROGRAM AND HAVE THE FOLLOWING COMMENTS:

- THE DEIS REFERS TO TWO EXISTING MILFOIL TREATMENT PROGRAMS IN WASHINGTON; ~~THE~~ LAKE WASHINGTON (REF. PARA 3.05.2); OSOYOOS LAKE (REF PARA. 2.03.7.2). THE SUCCESS AND IMPACT OF THESE PROGRAMS SHOULD BE DESCRIBED MORE FULLY IN THE FINAL EIS.

- HOW WERE AREAS OF MILFOIL INFESTATION IDENTIFIED? MY EXPERIENCE IN YARROW BAY WOULD INDICATE THAT THE AREA OF MILFOIL GROWTH ALONG THE EAST SIDE OF YARROW BAY IS MORE EXTENSIVE THAN INDICATED BY FIGURE 9.

- IS IT PRACTICAL TO TREAT ONLY SMALL PORTIONS OF LARGE MILFOIL GROWTH AREAS ? IN MANY CASES THE PROPOSED PROGRAM ONLY TREATS 100 FOOT WIDE CHANNELS NEAR THE SHORELINE. WON'T THE MILFOIL RAPIDLY REINFEST THESE CHANNELS ?

- HOW WERE THE DOLLAR BENEFITS OF THE PROGRAM DETERMINED FOR THE PUBLIC AREAS AS LISTED IN PARA (1.05.4) ?

- WHAT LIMITATIONS AND/OR SPECIAL TECHNIQUES ARE TO BE USED IN OR NEAR THE "SENSITIVE AREAS DISCUSSED IN PARA 2.02.11 AND 2.03.11 ?

THANK YOU FOR CONSIDERING MY COMMENTS.

SINCERELY,

Robert V. Dahl

ROBERT V DAHL

U.S. ENVIRONMENTAL PROTECTION AGENCY

REGION X

1200 SIXTH AVENUE

SEATTLE, WASHINGTON 98101

REPLY TO ATTN OF: M/S 443

AUG 30 1979

Maxey B. Carpenter, Jr.
Acting District Engineer
Seattle District, Corps of Engineers
P. O. Box C-3755
Seattle, Washington 98124

Dear Lt. Colonel Carpenter:

The Environmental Protection Agency has completed its review of your draft environmental impact statement for the Washington State Aquatic Plant Management Program. In general, our comments are intended to help you make the EIS more complete and understandable to the public, and we have therefore requested inclusion of certain additional information in the final EIS. The chemicals proposed for use as a preferred control strategy, including 2,4-D and endothall, are presently registered by EPA for the intended aquatic uses. We nevertheless urge caution in using these chemicals, including strict adherence to label restrictions, and any other appropriate measures to ensure that adverse effects on fish and wildlife resources, water quality, and public health are avoided. Such measures include avoiding treatment of sensitive habitat areas at sensitive times, and actively notifying the affected public of chemical treatment operations. EPA also supports continued consideration of nonchemical measures as the most acceptable long-term strategy for control of watermilfoil. Our specific comments follow.

1. We suggest the final EIS contain more detail about program administration, to allow the reader a greater understanding of how areas will be selected for treatment. The information on page 15 could be expanded to indicate who determines whether an area meets the listed criteria, how areas are prioritized for treatment, and whether the State can assume funding for high priority areas not funded locally. We believe a truly comprehensive statewide program requires the State to take a strong management role rather than simply responding to local requests. This is especially important for the prevention program.

2. We suggest the third criterion on page 15, dealing with environmental impact, be made more specific. Environmentally sensitive locations, as identified for example by the State Departments of Fish or Game, should probably not be treated. We also suggest adding a criterion that treatment in the proposed area is expected to be effective.

3. The final EIS should contain, in the text, more specific information on environmentally sensitive locations and times, compared with proposed treatment areas and times and chemical concentrations. Information should be provided on when and where sensitive life stages of important fish species occur. Maps would be most useful. As it is, the information on potential aquatic impacts is mostly general and abstract. Providing more site specific information would also indicate more accurately the need for mitigation measures.

4. The final EIS should more explicitly discuss whatever is known about long-term treatment needs for the various control alternatives, and the resulting long-term impacts, including economic effects. What can be said about degree of reinfestation of milfoil under the various types of treatment? How often will chemical and mechanical treatment be needed? Comparison should be made with the long-term effects of no control program.

5. We are especially concerned that the various screening techniques have been prematurely discarded, mainly due to short-term economic considerations. Over the long-term, a single screening application may compare more favorably with chemical treatment which must be frequently repeated.

6. The apparent disproportionate benefits attributed to Lake Sammamish State Park on page 29 should be better explained. Are benefits based primarily on quantity of visitor use, and is use at Lake Sammamish that much higher than other areas? Use figures would be helpful.

7. The final EIS should contain an explanation of what monitoring will take place with the chemical control program, and who has the responsibility for such monitoring. Site-specific follow-up information on drift, persistence in water and sediments, and impacts on aquatic organisms may be useful in certain cases.

8. The statement on page 6 (1.03.4) concerning adverse impacts of watermilfoil on waterfowl is not consistent with information on page B-19 from the U.S. Fish and Wildlife Service referring to British Columbia studies.

9. On page 11 (1.03.6), more specific information on potential spread of milfoil would be helpful.

10. Reference should be made on page 31 (1.07.2) of the requirement that chemical application follow label restrictions, under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). Also the reference on page 46 (3.02) to the Federal Pesticide Act of 1978 should more correctly be the 1978 amendments to FIFRA.

11. The final EIS should contain up-to-date information on both the Metro study and the State Department of Ecology 1979 control program, and indicate how any new information will be incorporated into the Corps of Engineers' program.

12. More specific information on the persistence of the proposed chemicals should be included in the text at page 51 (4.03.5). This material is in the Appendix and should be summarized in the text.

13. The reference on page 65 (6.01.4) to Silvex should point out that aquatic use of Silvex has been prohibited by EPA.

The Environmental Protection Agency has rated this draft statement LO-2 (LO - Lack of Objections; 2 - Insufficient Information). This rating will be published in the <u>Federal Register</u> in accordance with our responsibility to inform the public of our views on proposed Federal actions under Section 309 of the Clean Air Act, as amended.

Thank you for the opportunity to review this environmental statement. If you have questions or would like to discuss these comments, please feel free to contact me or Craig Partridge of my staff at (206) 442-1285 or (FTS) 399-1285.

Sincerely,

Roger K. Mochnick for

Alexandra B. Smith, Chief
Environmental Evaluation Branch

STATE OF WASHINGTON
Dixy Lee Ray
Governor

DEPARTMENT OF ECOLOGY
Olympia, Washington 98504 206/753-2800

Mail Stop PV-11

August 31, 1979

Lt. Col. Maxey B. Carpenter, Jr.
U. S. Army Corps of Engineers
Seattle District
P. O. Box C-3755
Seattle, Washington 98124

Dear Colonel Carpenter:

We have reviewed your Aquatic Plant Management Program Draft Environmental Impact Statement and offer the following comments for your consideration.

The document is generally well written, well organized, and very readable.

There are a couple of areas that, if expanded or explained in greater detail, would be helpful to both the state, as the "umbrella" sponsor, and local governments in ascertaining the fiscal and manpower impact of the Aquatic Plant Management program. For example, on page 31, there is a general description of the "Prevention Program," but there is no indication as to the extent of state or local involvement expected by the Corps in "Aerial Surveillance and Regulatory Inspections." What is meant by "Regulatory Inspections" and who (state, local, or USCE) is expected to perform them? A description of the procedures involved in developing a cost-sharing aquatic plant management program with the Corps, along with a PERT diagram of all significant activities and the responsible agency, would be especially helpful.

Page 29 contains a table of the proposed treatment areas and the identified benefits expressed in dollars. The benefits of treatment in all of Lake Washington total $182,1CO; for Lake Sammamish the total benefits are listed at $747,500. It would seem that there should be some explanation as to why the recreational benefits of treatment in Lake Sammamish are four times greater than all of Lake Washington.

The first two species of aquatic plants mentioned under 2.02.7.1 on page 40 should be capitalized since they recognize the name of the person who originally keyed the plant (i.e., Potomogeton Berchtoldii and P. Richardsonii).

On page 68, under "No Action," statements such as "Obstruction to navigation and recreational use would progressively increase..." Use of terms such as "would possibly" may be more appropriate since the impact of no action is not all that certain. There have been cases where milfoil infestations have actually decreased when left alone.

Lt. Col. Maxey B. Carpenter, Jr.
August 31, 1979
Page No. Two

On page 14, under paragraph 1.04.10, it states that "Each barrier is only 80 to 90 percent effective in stopping milfoil fragments..." The effectiveness of a mechanical barrier has never really been determined; therefore, it would be more technically accurate to simply say that "A barrier is not 100 percent effective in capturing all milfoil fragments."

The control alternatives suggested for most of the areas proposed for treatment would require treatment annually and throughout the season. We would suggest a discussion be included describing the number of treatments required over a growing season and the impact of long-term repeated treatment.

Thank you for the opportunity to comment.

Sincerely,

Dennis L. Lundblad, Supervisor
Comprehensive Management Division

DLL:dt

STATE OF WASHINGTON
Dixy Lee Ray
Governor

DEPARTMENT OF ECOLOGY
Olympia, Washington 98504 206/753-2800
Mail Stop PV-11

August 31, 1979

Lt. Col. Maxey B. Carpenter, Jr.
U. S. Army Corps of Engineers
Seattle District
P. O. Box C-3755
Seattle, Washington 98124

Dear Colonel Carpenter:

Thank you for the opportunity to comment on your Aquatic Plant Management Program Draft Environmental Impact Statement. As you requested, we have coordinated the review of this report with other state agencies and have received comments from the Departments of Fisheries, Game, Natural Resources, Transportation, and the Parks and Recreation Commission.

Following is a summary of their comments. A copy of each agency's response letter is enclosed for additional specific information.

Department of Ecology

The document is generally well written and organized. It would be helpful to explain in more detail the role of state and local agencies involved in the management program, and any possible procedures involved in developing a cost-sharing program.

Department of Game

Control of watermilfoil should be directed to areas of heavy boating and swimming use, and not near sensitive sites. Certain non-selective chemicals should not be used, and although 2,4-D appears to be the least damaging herbicide, it should not be used in spawning or rearing sites during critical periods. Milfoil control measures would require hydraulics project approval from the Departments of Fisheries and Game.

Department of Fisheries

The Department of Fisheries must be reasonably assured that chosen control measures do not impact foodfish resources. The department responds favorably to use of 2,4-D in salmon areas if the application is timed between salmon migrations. The department recommends a water sampling program be conducted to determine the concentration of 2,4-D throughout the water column. High use salmon areas should be treated only after the results of the sampling program are obtained.

Department of Natural Resources

The final EIS should address the possible effects of chemical control upon phytoplankton and related food chains.

Parks and Recreation Commission

Control of milfoil in recreation areas will be extremely beneficial particularly for swimming, boat launching and water skiing. Heavy infestations of watermilfoil will necessitate closing recreation facilities.

Department of Transportation

No comments to offer.

Thank you for the opportunity to comment. If you have any questions, please contact the appropriate state agency or Ms. Barbara Ritchie of our Environmental Review Section (753-6892).

Sincerely,

Fred D. Hahn

Fred D. Hahn, Assistant Director
Office of External Affairs

FDH:dt

Enclosures

cc: Barbara Ritchie, Department of Ecology
William Rees, Department of Fisheries
Bob Zeigler, Department of Game
Tom Mumford, Department of Natural Resources
Dave Heiser, Parks and Recreation Commission

STATE OF WASHINGTON
Dixy Lee Ray
Governor

DEPARTMENT OF FISHERIES
115 General Administration Building, Olympia, Washington 98504 206/753-6600

August 20, 1979

Mr. Wilbur Hallauer, Director
Department of Ecology
St. Martin's College
Lacey, Washington 98504

Attention Barbara Ritchie, Environmental Review Section

Dear Mr. Hallauer:

The Washington Department of Fisheries (WDF) has reviewed the Draft Environmental Impact Statement (EIS) for the Corps of Engineers Aquatic Plant Management Program for the State of Washington. The Department of Ecology (DOE) has been designated by the Governor as State Clearinghouse for such Corps of Engineers' proposals. Therefore, we request that this entire letter be attached to your coordination letter as part of the state response to the federal document. We believe that our past and present comments, actions, and recommendations are constructive and should receive close attention. Many of our present comments are verbatum from letters on the SEPA document for Lake Washington.

GENERAL COMMENTS

The Department of Fisheries recognizes a need to control milfoil in certain areas of the state, but at the same time must be reasonably assured that chosen control measures do not impact foodfish resources.

Eurasian milfoil is unsightly, presents a potential hazard to swimmers and may interfere with water skiing. Mechanical harvesting, covering the substrate with screens, and herbicide application are the three popular control measures. The first two appear promising in certain situations and herbicide use (2,4-D) is known to be effective for milfoil eradication. However, herbicides are toxic to fish. No impacts to salmon are expected from the physical control methods, if properly conducted.

Since the problem was identified in about 1977, the Department of Fisheries has responded to proposed in-water herbicide use in the following manner, attempting to endorse milfoil control, but at the same time protecting our resources (Duties of the Department RCW 75.08.012):

1. Respond favorably to use of 2,4-D in non-salmon areas, e.g., Banks Lake.

2. Respond favorably to use of 2,4-D in salmon areas if the application is timed between salmon migrations, e.g., Lake Osoyoos-Okanogan River.

3. Respond negatively if 2,4-D is proposed for application during major salmon migration periods adjacent to major migration routes, e.g., Union Bay adjacent to the ship canal and the mouth of Issaquah Creek below the hatchery.

However, in 1978, we agreed to the use of 2,4-D in Union Bay if the proponent (METRO) assured us through bioassay that the application would not directly impact salmon. We understand that, after about a year of planning, the bioassay was eliminated because the Interagency Technical Review Committee for the Union Bay Milfoil Demonstration Study concluded the available funding was not adequate to thoroughly evaluate that portion of the overall study. Since METRO's on-going studies and literature review on milfoil control are not yet available, the department has reviewed certain literature in order to make recommendations on herbicide use.

SPECIFIC COMMENTS BY PARAGRAPH NUMBER

1.04 Proposed Methods for Control and Containment

1.04.5 Chemical Control. We ask why chemicals other than 2,4-D BEE are proposed when (1) more may be known on the toxicity of this chemical than of the other candidates; (2) 2,4-D BEE kills the entire plant thus reducing future growth while the other chemicals may only retard growth and; (3) 2,4-D is selective to the target species thus reducing possible problems of low-dissolved oxygen which could be more severe if the majority of the vegetation (several species) began to decompose following treatment with the broader spectrum herbicides.

1.04.6 Bottom Shading. The projected cost of fiberglass screens per acre should be included to help decision makers select alternatives for relatively small areas where use of chemicals would be risky for foodfish at certain times of the year.

1.05.1 Proposed Control Program, Lake Washington

The Corps of Engineers is to be commended on the excellent figures in the text denoting milfoil infestation and proposed treatment areas. We note, however, there are no figures for Seward, Madrona, and Pritchard Parks. For your convenience we are enclosing charts depicting known sockeye salmon beach spawning areas where no control measures should be undertaken between November 1 and June 15 of the following year to protect incubating eggs and fry.

1.05.1.1 Union Bay

We concur with your recommendations for mechanical harvesting anytime. Until studies determine the actual concentrations of 2,4-D BEE in the water column following application, this chemical should only be used during the first two weeks of August, and then applied at absolute minimum levels for the protection of migrating salmon.

1.05.1.2. Lake Forest Park - Kenmore Area

Areas close to the mouth of the Sammamish River should receive particular attention as to choice of treatment and timing. Downstream migration of salmon should be complete by about mid-July, but adults begin concentrating in the area about the first of August. High summer temperatures in the Sammamish River cause a migration block to salmon, annually until fall rains begin.

1.05.2 Lake Union

Portage Bay in the ship canal is the only area proposed for treatment in Lake Union. Use of herbicides could be very hazardous because the proposed area is probably directly in the fish migration route rather than adjacent to the migration route like in Union Bay. Use of mechanical harvesting or screens may be the only safe technique at this site. The Corps of Engineers should also contact the University of Washington's fish hatchery for location of the water intake structure(s).

1.05.3 Lake Sammamish

We fail to understand the recommendation for use of chemicals at this site prior to the results of METRO's literature review and information on the concentration of 2,4-D BEE throughout the water column. We also note that identified benefits at the state park from milfoil control is the major benefit as shown on the table on page 29 ($747,500 or 80.4% of total Lake Washington - Sammamish Federal Program). Since only two to four acres are involved, we would be interested in learning the costs for control by shading on an annual basis. The 1977-1978 salmon program at the Issaquah Creek Hatchery cost the state about $120,000 to produce 96,000 pounds of fish. This production has an approximate value to the various fisheries of $1,440,000. All fish released from the hatchery must pass through this site and small chinook would probably rear in the vicinity for some time.

1.06.1 Osoyoos Lake and 1.06.2 Okanogan River

The Department of Fisheries has no concern for proposed treatment during the months of July and August and have issued Hydraulic Project Approvals jointly with the Department of Game for milfoil barriers at the outlet of the lake.

1.06.3 Other Water Bodies

The Department will review other proposals on a case-by-case basis.

1.07 Mitigation

1.07.2 Chemical Control

What is meant by the application of minimum levels for control? We would also appreciate learning the concentration of 2,4-D BEE throughout the water column over time. Why are chemicals other than milfoil effective 2,4-D BEE being proposed?

2.02 Seattle Area

2.02.3 Fish and Wildlife

We suggest expanding this section to specify timing by species as supplied throughout this letter.

3.03 State Laws

Hydraulic Project Approvals from the Department of Fisheries and Game will be required for installation of barriers and screens.

4.06 Impacts on Fish

4.06.5.1 2,4-D

We believe this section is incomplete but hopefully, METRO's literature will be of assistance. Please refer to our section on our recommendations including selected references. Also, we do not agree entirely with the statement " ---- and no fish kills, due to the toxicity of the chemical, would be expected at the concentrations used to control milfoil." The concentrations of 2,4-D shown in Table 3, in general, exceed our recommended 0.1 mg/l maximum level for the protection of salmon. In addition, it appears the application rates on Table 3 are far lower than the 100 lbs. per surface acre currently proposed for use by commercial applicators in Lake Washington.

4.06.5.2 Endothall, Casoron, Diquat

Same comments as above and refer to Folmar, 1977.

6.01.8 Sand and Gravel Blanket

We suggest reconsidering this alternative in certain areas because no impact to salmon should occur unless located on a spawning beach.

9.08 Fish and Wildlife Coordination

We appreciate having our letters on this topic dated July 29, 1977, May 1, 1978 and July 6, 1978 included in Appendix b. Our letter to the Department of Ecology dated April 24, 1979 should also be included.

RECOMMENDATIONS

The Department of Fisheries, acutely aware of the milfoil problem, met internally in March, 1979 to outline a program which would evaluate herbicide application while still being protective to salmon in or adjacent to a herbicide treatment area. The following three steps were proposed:

1. Utilize the readily available literature to determine a reasonably safe concentration to salmon of a known, milfoil effective herbicide (2,4-D BEE) in the water column.

2. Recommend a spray project in the absence of large numbers of salmon to be monitored by a water quality agency to determine the actual concentrations of 2,4-D BEE (mg/l) throughout the water column following a fixed rate of herbicide application (lbs/acre).

3. Compare the results of the spray project and the literature review to determine if 2,4-D BEE could be safely used close to areas of heavy salmon usage such as adjacent to Union Bay.

Our literature review concluded that the concentrations of 2,4-D BEE, following a single application only, should not exceed 0.1 mg/l (as measured for the ester and not free 2,4-D acid) anywhere in the water column where significant numbers of salmon may be present. For multiple applications, the ester concentration should not exceed 0.031 mg/l. (Woodard, D.F. and F.L. Mayer, Jr. 1978)

Therefore, the Washington Department of Fisheries recommends the following for the protection of resources under its jurisdiction only (RCW 75.04.040):

1. Conduct a spray application of 2,4-D somewhere in Lake Washington, except Laurelhurst (Union Bay), or the mouth of the Sammamish River, anytime after June 15 when the sockeye fry have emerged from spawning gravels in or closely adjacent to the treatment area. The rate of application (lbs/acre) should be setat the absolute minimum necessary to accomplish desired milfoil control.

2. Arrange for a competent water sampling program similar to that considered by METRO in December 1977, to determine the concentration of 2,4-D BEE (Ester) throughout the water column over time, in and outside the treatment area to compare with the reasonably safe levels for salmon described above.

3. Treat the high use salmon areas only after the results from above are obtained or postpone until specified by Washington Department of Fisheries. The Department of Game should also be consulted for resources under their jurisdiction. This recommendation applies only to herbicide use and salmon resources.

Bibliography and References

We suggest including the following publications which have been used for our review and recommendations:

Folmar, L.C. 1977. Acrolein, dalapon, dichlobenil, diquat, and endothal: bibliography of toxicity to aquatic organisms. Technical Papers of the U.S. Fish and Wildlife Service. No. 88. 16pp.

Lorz, H.W., S. Glenn, R.H. Williams, C.M. Kunkel, L.A. Norris, and B.R. Loper, 1979. Effects of selected herbicides on smolting of coho salmon. Environmental Protection Agency, Corvallis Environmental Res. Lab. (In Press).

Meehan, W.R., L.R. Norris, and H.S. Sears. 1974. Toxicity of various formulations of 2,4-D to salmonids in southeast Alaska. J.Fish. Res. Board Can. 31:480-485.

Schults, D.P. and P.D. Harman. 1974. A review of the literature on the use of 2,4-D in fisheries. Bureau of Sport Fisheries and Wildlife, Report No. PB-235-457. Available through N.R.I.S.

These recommendations apply only to the fisheries resources under the jurisdiction of the Department of Fisheries. Thank you for the opportunity to comment and we hope our recommendations will be of value to all concerned with milfoil control

Sincerely,

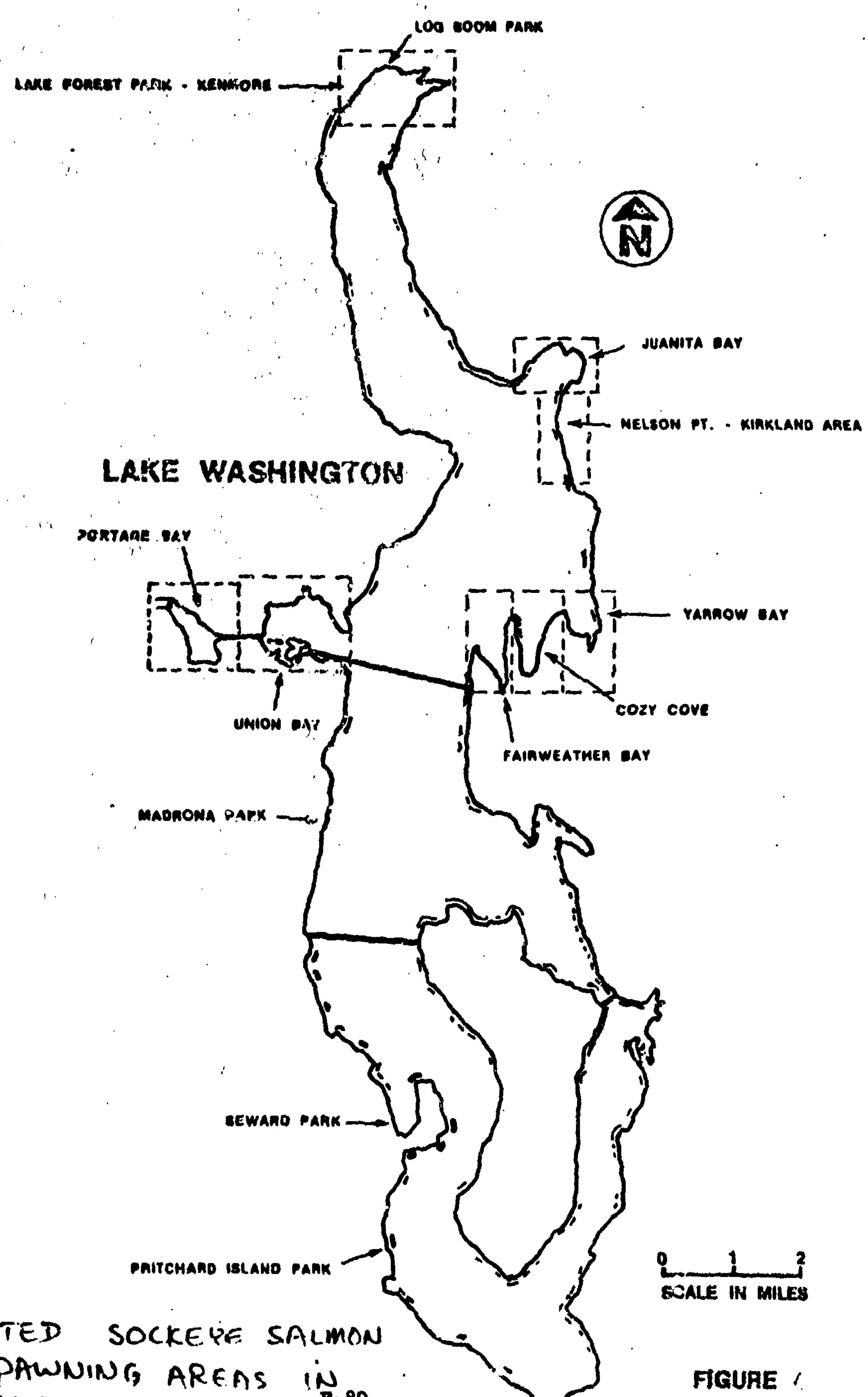
William R.

Gordon Sandison
Director

kn

Attachments

cc: Mr. Robert Rawson, Seattle COE
Mr. Robert Matsuda, Seattle METRO



DOCUMENTED SOCKEYE SALMON BEACH SPAWNING AREAS IN LAKE WASHINGTON

FIGURE /

E-80

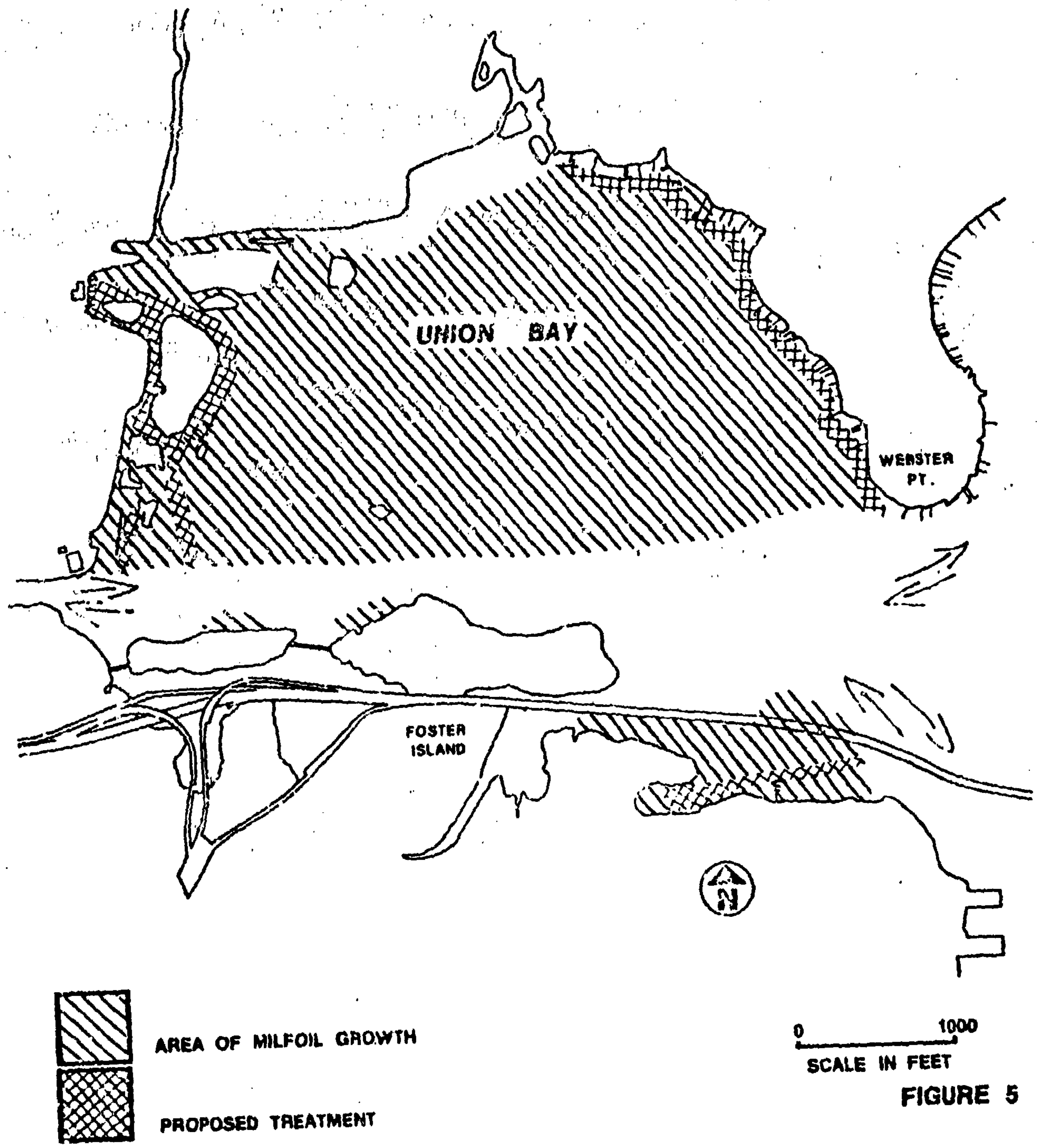


FIGURE 5

MAJOR SALMON MIGRATION ROUTE

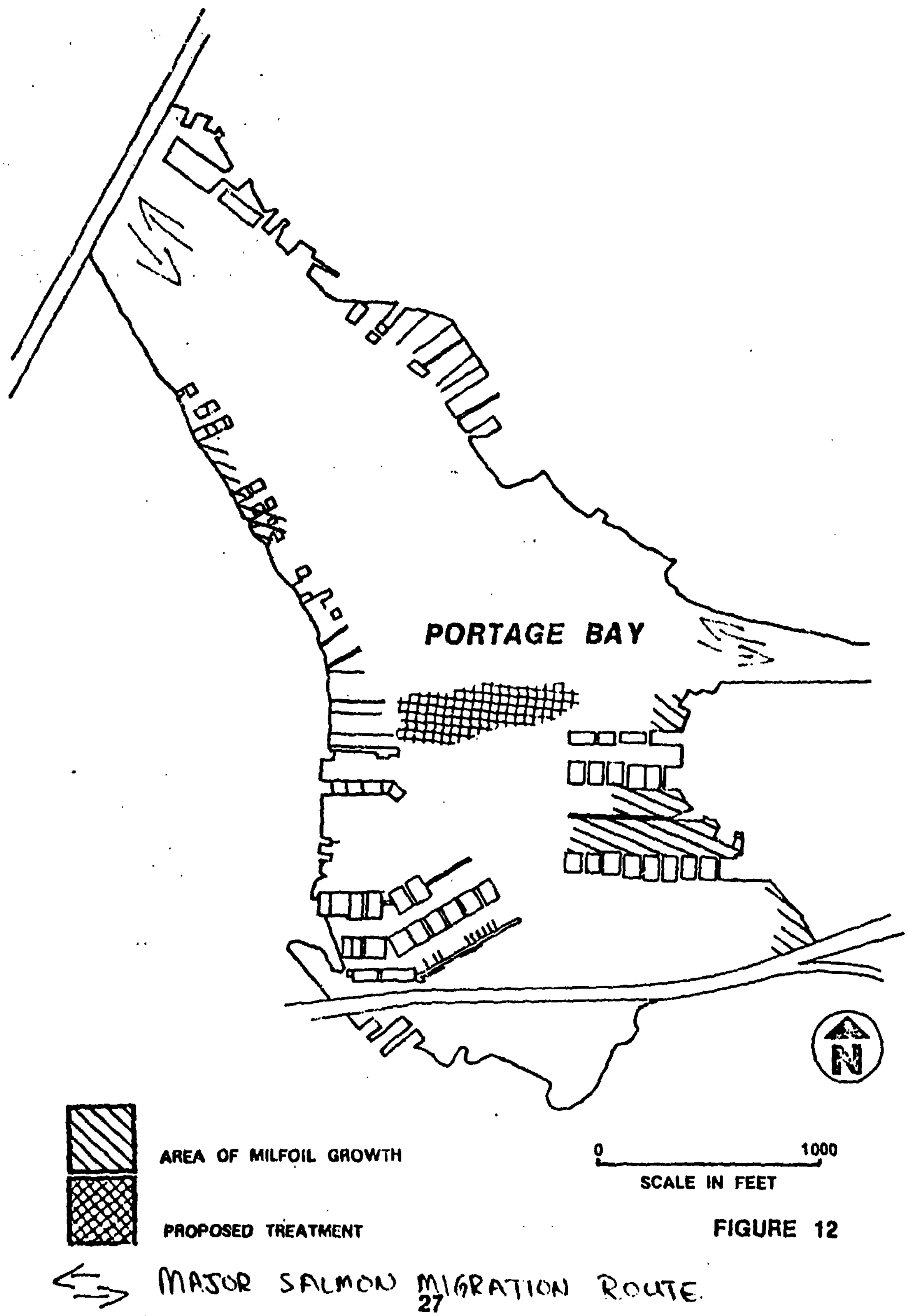


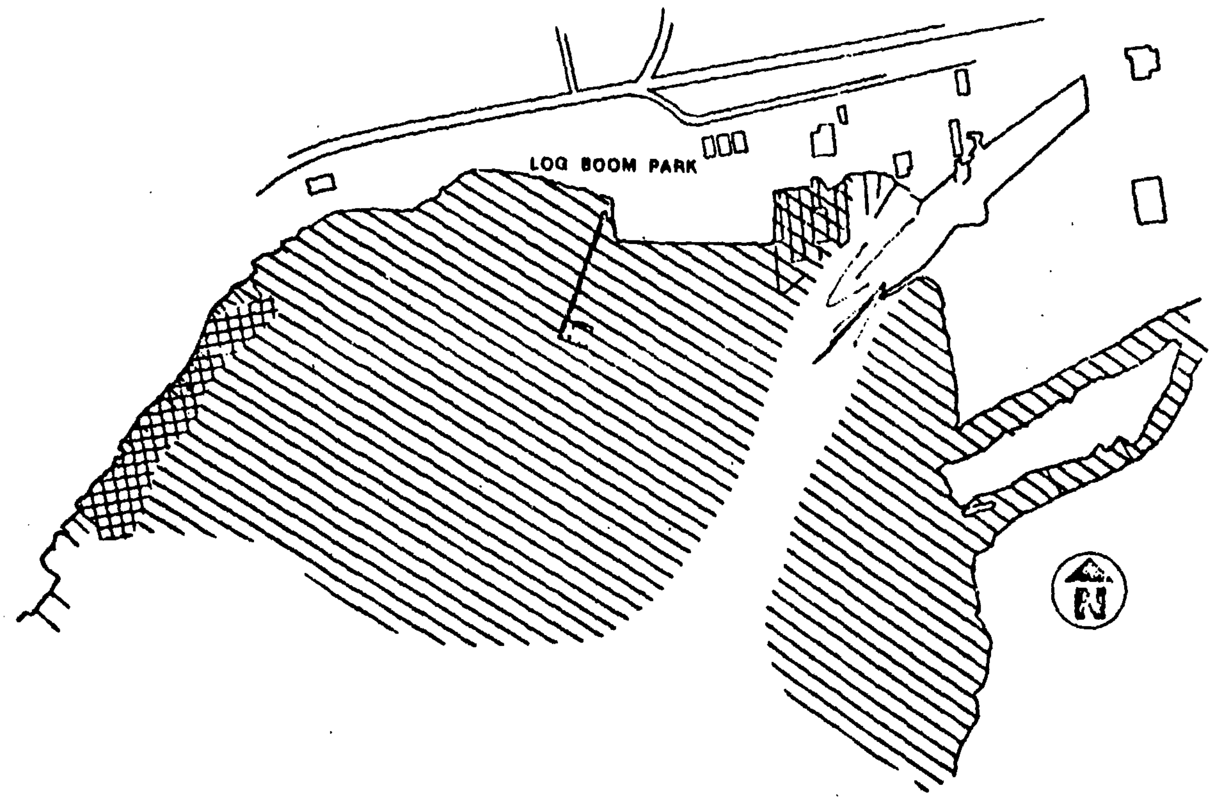
FIGURE 12

1000

: 11

27

LAKE FOREST PARK - KENMORE



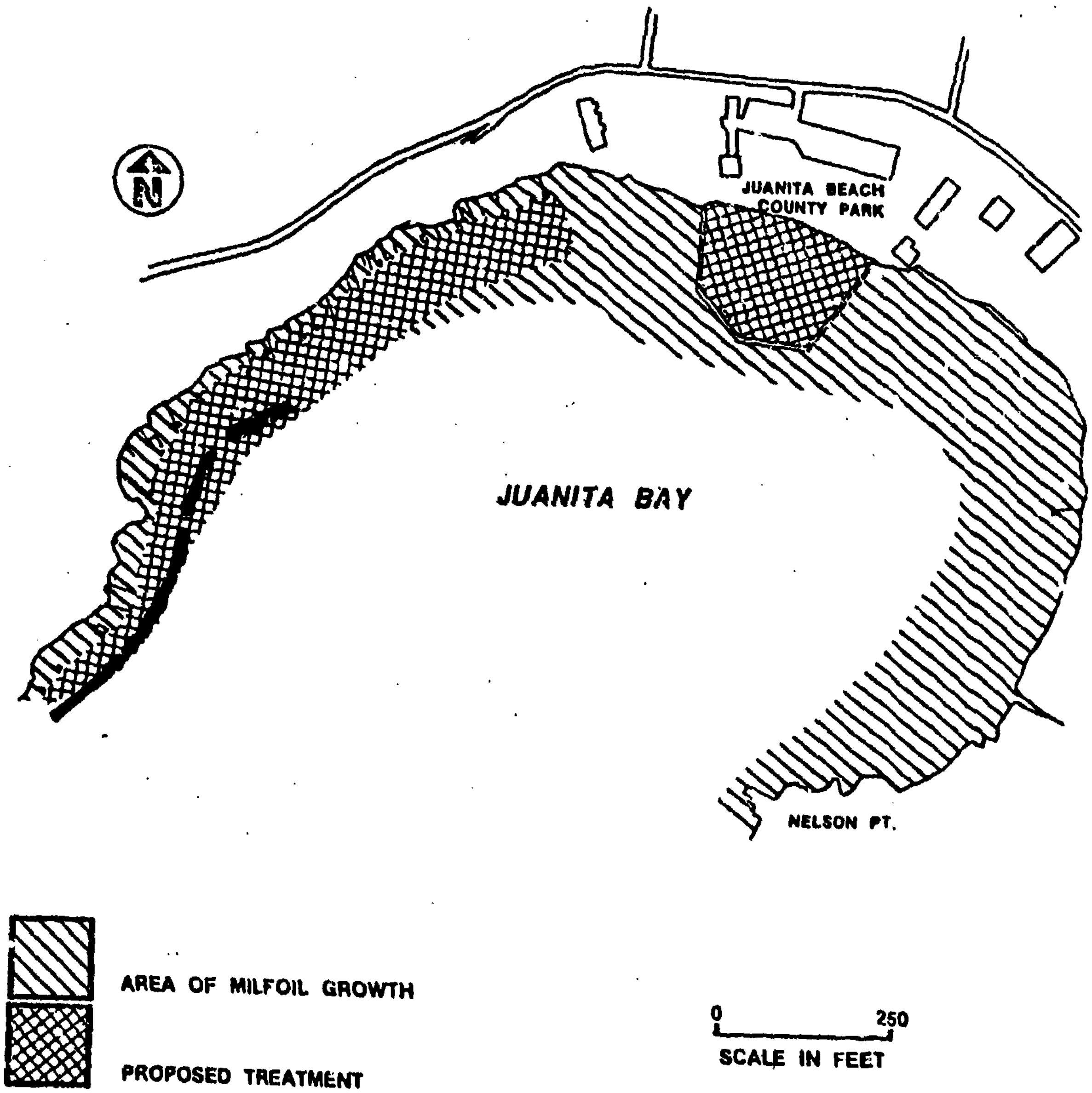
MAJOR SALMON MIGRATION AND MILLING AREA

AREA OF MILFOIL GROWTH

PROPOSED TREATMENT

0 1000
SCALE IN FEET

FIGURE 6



— Approximate Location of Sockeye Beach Spawning Areas

FIGURE 7

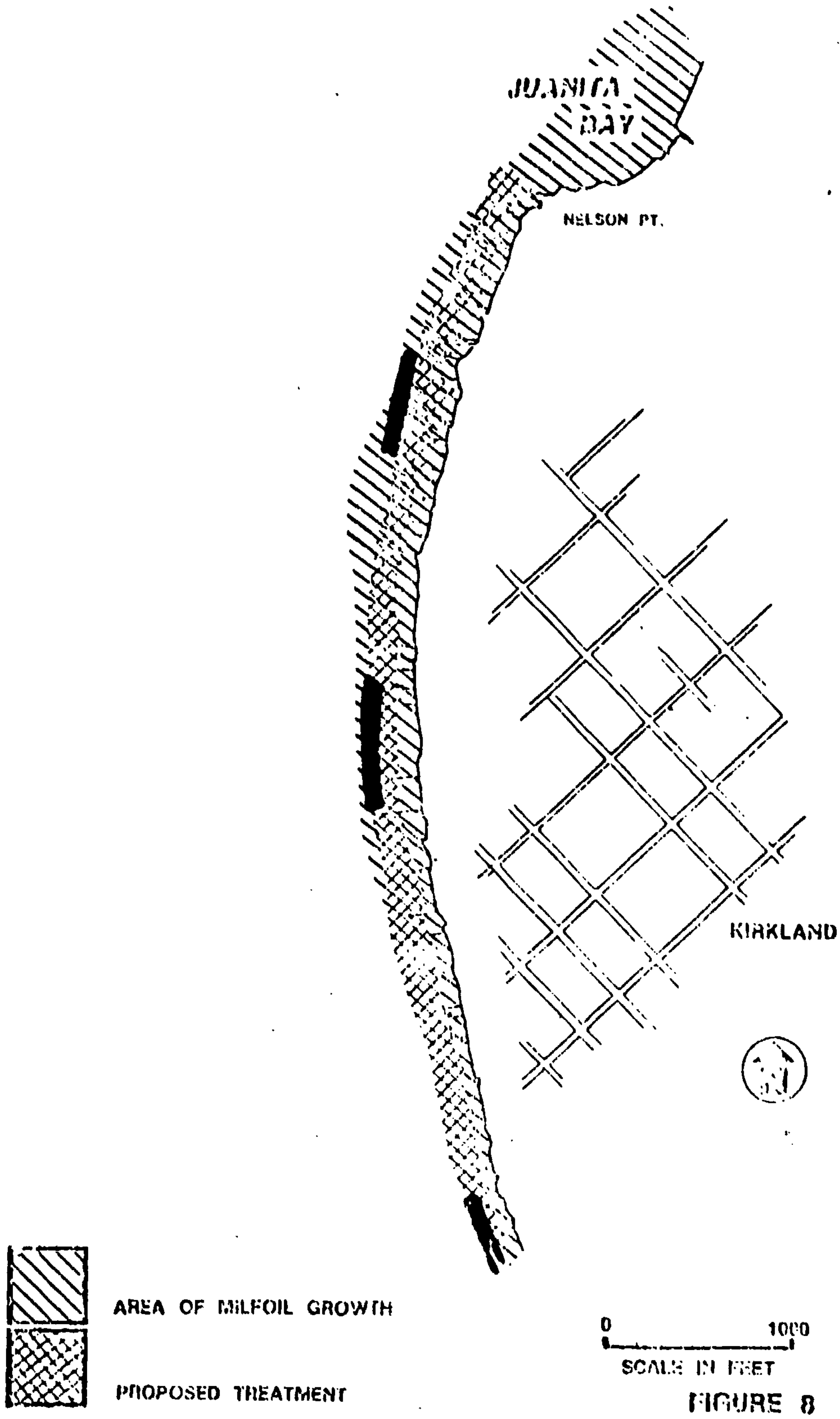


FIGURE 8

— APPROXIMATE LOCATION OF
SOCKEYE BEACH SPAWNING AREAS

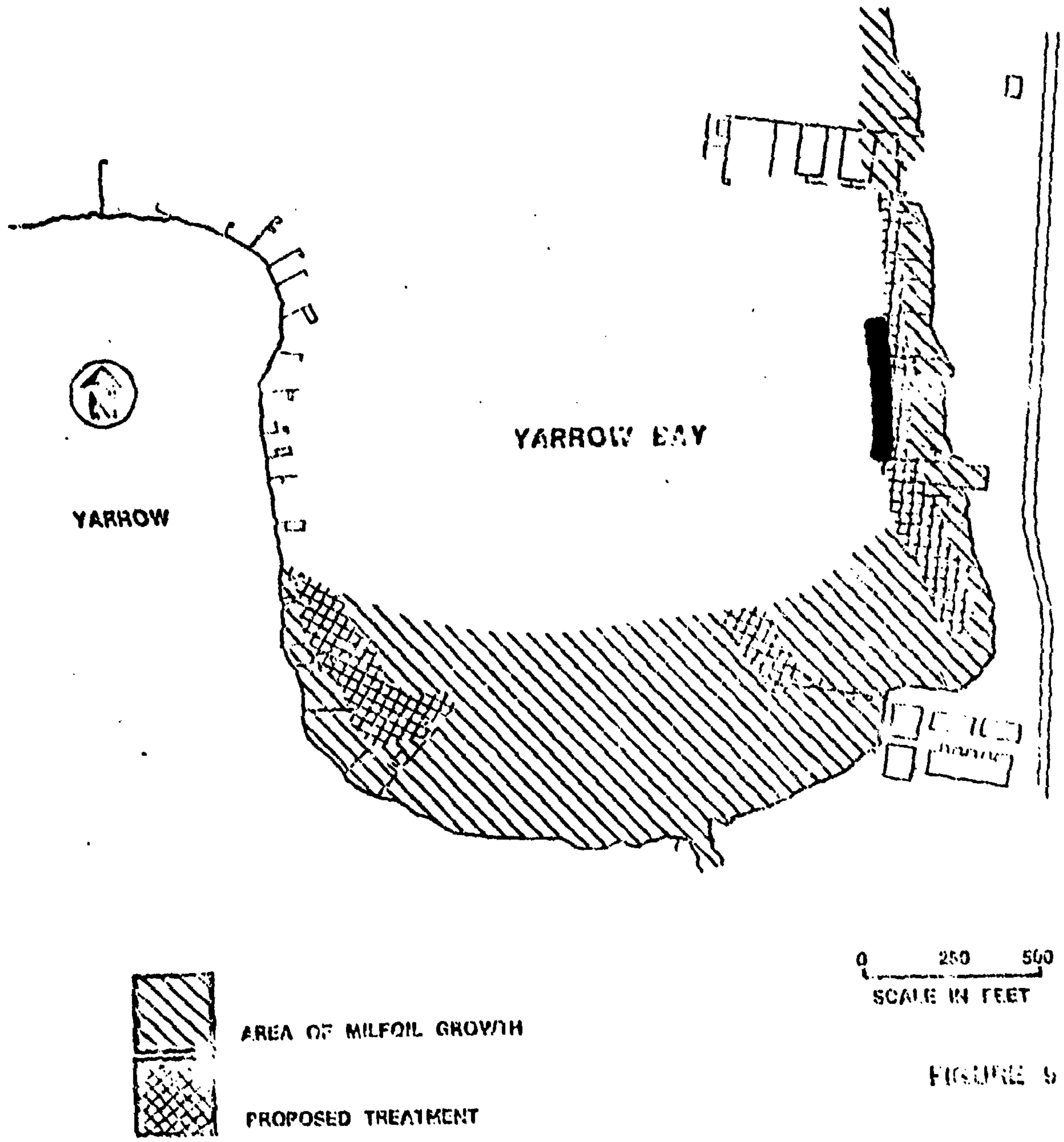


FIGURE 9

— Approximate Location of Sockeye Beach Spawning Areas

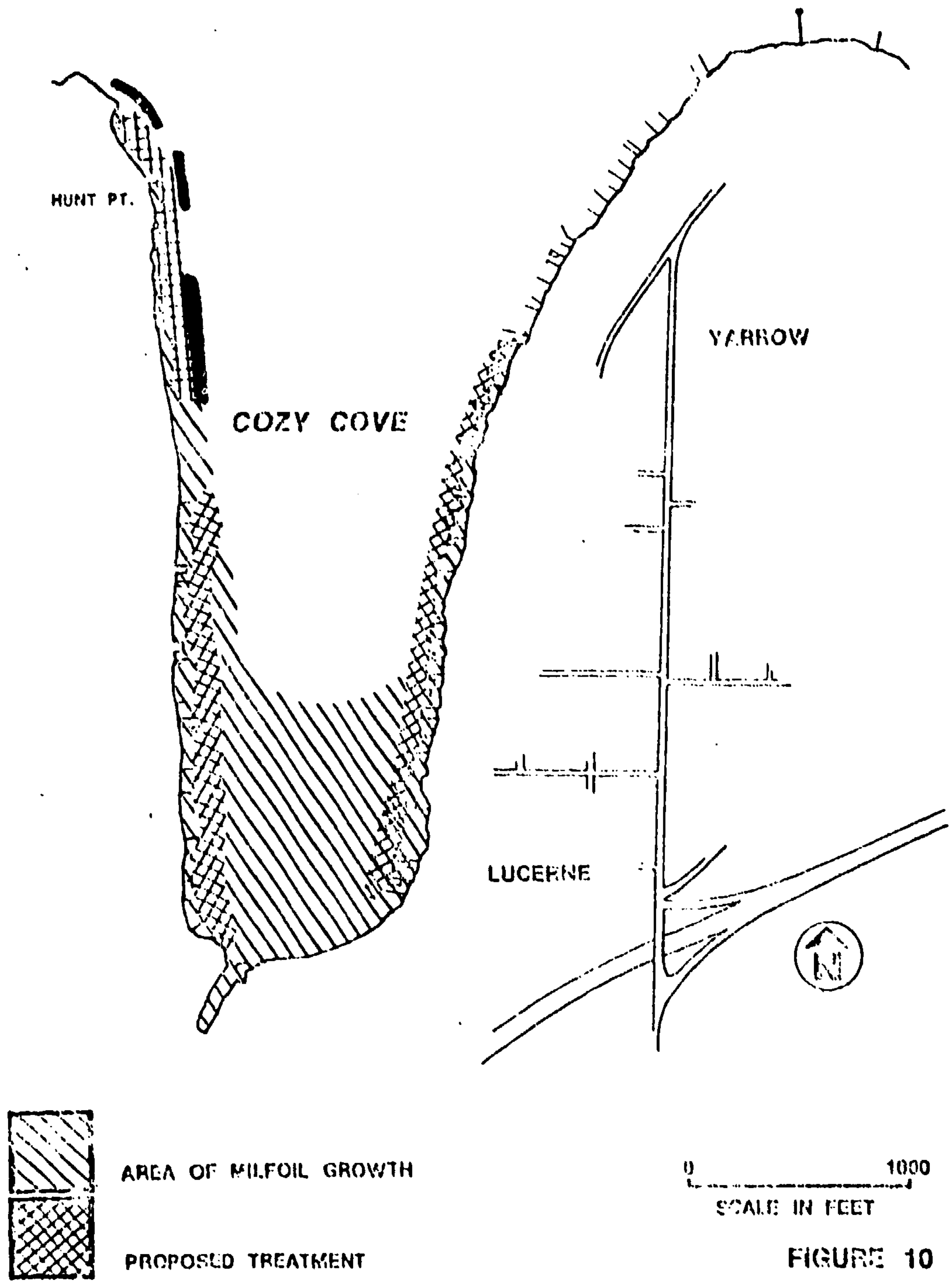


FIGURE 10

Approximate Location of Sockeye Beach Spawning Areas

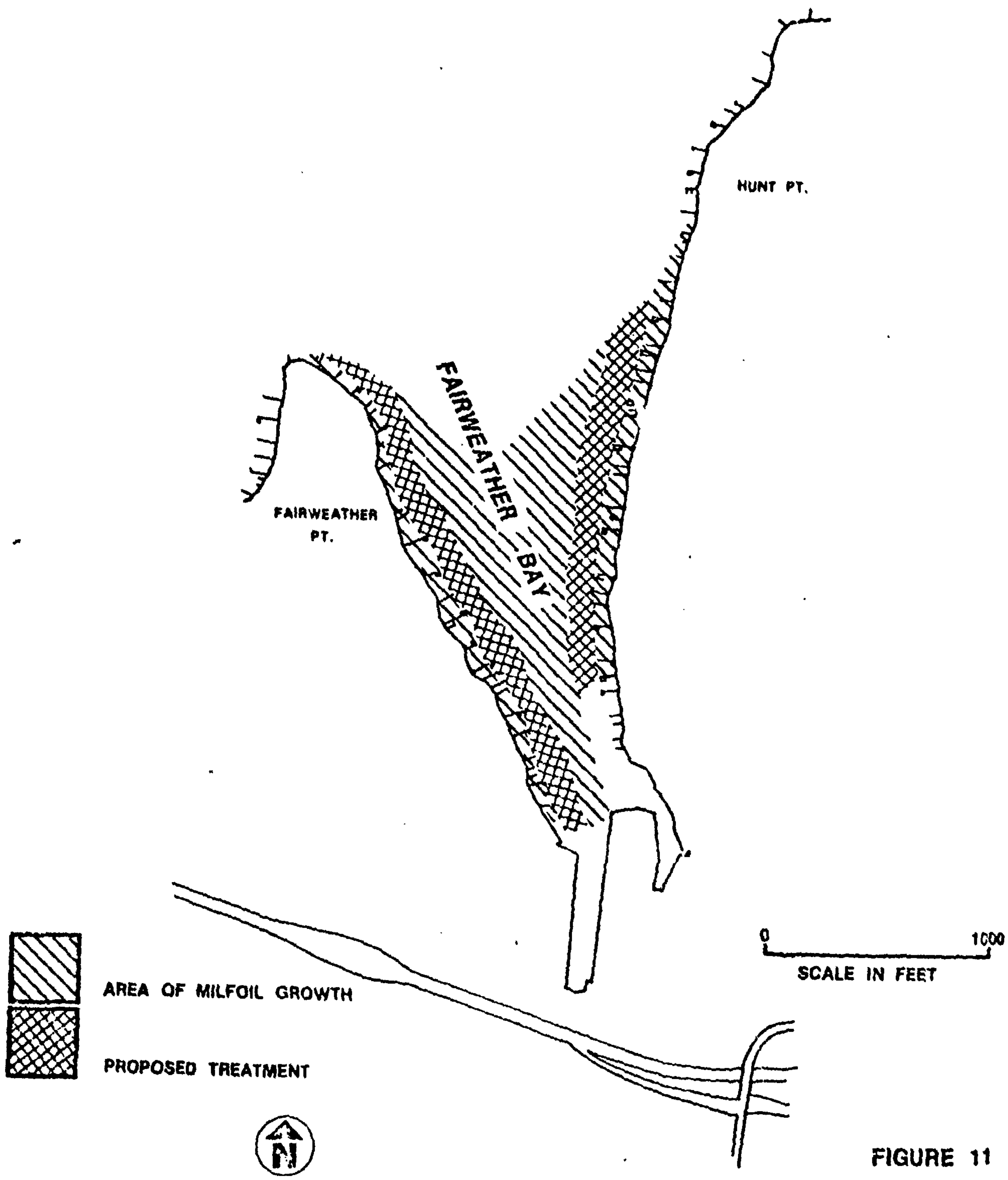

HUNT PT.
FAIRWEATHER BAY
FAIRWEATHER PT.
AREA OF MILFOIL GROWTH
PROPOSED TREATMENT
0
1000
SCALE IN FEET
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FIGURE 11

STATE OF WASHINGTON
Dixy Lee Ray
Governor

DEPARTMENT OF GAME
600 North Capitol Way, GJ 11 Olympia, WA 98504   206/753-5700

August 23, 1979

Maxey B. Carpenter, Jr.
Lt. Colonel, Corps of Engineers
Acting District Engineer
Seattle District, Corps of Engineers
P.O. Box C-3755
Seattle, Washington 98124

DRAFT ENVIRONMENTAL IMPACT STATEMENT:

Aquatic Plant Management Program -
State of Washington (Lake Washington,
King County, and Lake Osoyoos and
Okanogan River in Okanogan County)

Colonel Carpenter:

Your document was reviewed by our staff as requested; our comments follow.

We concur that Eurasian watermilfoil can create problems. However, we recommend that control be directed to areas of heavy boating and swimming use. In your discussion of marsh areas (page 41) you state, "Care must be taken in the selection of control methods to insure that the fish and wildlife values of sensitive sites are protected". Unless the milfoil is detrimental to fish resources in these areas, would it be necessary to attempt to control it in these sensitive sites?

We have concerns over the use of chemicals to control milfoil. Because they are non-selective, we recommend that endothall, casoron, diquat, simazine, silvex, and fenac not be used. While 2,4-D appears to be least damaging herbicide, we are not confident that it would not impact fish fry nor possibly present long-term impacts to fish or wildlife production. In general, we would recommend against its use in wetlands and spawning and rearing sites for salmonids and spiny-rayed fishes. For control of milfoil adjacent to sensitive areas we would recommend only hand removal. We have included information we have on spiny-ray habitat in Lake Washington.

We are also concerned with the impact of large amount of dissolved oxygen being "taken out of the water by the biological decomposition of dead milfoil". This can be critical since the preferred time for chemical treatment is summer, a time when dissolved oxygen is reduced as a result of elevated water temperature.

We concur with your statement on page 67: "Biological control may be the most economical and the least disruptive method to deal with milfoil. However, we are concerned with the long-term impacts of the importation of exotic species. It is illegal to import or have possession of the white amur in Washington State (WAC 232-12-670 of RCW 77.04). For biologic control, we would recommend using native species of insects or planting native aquatic vegetation such as water lilies or other macrophytes that may resist milfoil infestation. Additional research should be performed to identify the best biologic control to use (page 62).

Have marinas, bulkheads, and breakwaters encouraged the growth of milfoil by restricting flushing? Could hydraulic improvements to allow greater flushing help control growth in these heavily used areas?

Is there any possibility that milfoil control could actually encourage infestation by maintaining conditions that allow for explosive growth and eliminating natural limiting factors? If all vegetation is removed from an area would this allow recolonization of the milfoil?

On page 11 you state, "One of the main problems with harvesting milfoil is upland disposal. Transport and handling are expensive and many attempts have been made to find a use for the harvested milfoil to partially defray the cost." Would it be possible to allow gardeners to pick up composted milfoil? Milfoil could serve as a source of potassium. It may not be necessary to transport but it could be given to gardeners who would haul it away.

Is there any correlation between milfoil and encephalitis outbreaks? It seems unlikely that milfoil would increase mosquito-borne diseases (page 58).

Additional comments follow on Lake Washington and the Okanogan River system.

Lake Washington is important for wildlife production especially in the ten remaining wetland areas. Lake Washington also provides waterfowl feeding and resting area during fall migration (page 41).

Okanogan River and Lake Osoyoos are both important for fish and wildlife production as well as a source of irrigation water (page 44). Does this system hold potential for serious milfoil infestation? It would seem that hydraulic factors

involved in the river and reservoir would prevent massive milfoil growth. Stream flow, fluctuating water levels and low reservoir productivity should limit milfoil. Would you explain what type of barrier would be constructed in Okanogan River to prevent the spread of milfoil (page 30)? Would it interfere with fish migration?

While different control methods would be appropriate in different cases, extreme care should be taken to insure that impacts to fish and wildlife are minimal. Milfoil control measures would require Hydraulics Project Approval from the Departments of Fisheries and Game.

Thank you for sending your document. We hope you find our comments helpful.

Sincerely,

THE DEPARTMENT OF GAME

Bob Zeigler

Bob Zeigler, Applied Ecologist
Environmental Affairs
Habitat Management Division

BZ:mjf

cc: Regional Manager
Agencies

Attachment

and neighboring wetlands (the latter being areas having high water tables at or near the surface most of the year and possessing characeristic bog and marsh vegetation). Lists of those birds and mammals known to frequent the lakeshore and adjacent areas are given by McGreevy (1974), City of Bellevue (1972), City of Kirkland (1973), Puget Sound Task Force (1970), and others.

3.2 Occurrence of Habitat Features

The specific locations where I observed vegetation or debris on the 2nd of November are listed below by habitat feature (plants or debris). The locations of bass habitat as defined by Stein (1970) are also described.

3.2.1 Rooted Submergent Plants

1. Vicinity of mouth of Sammamish River, Kenmore.
2. Northern half to two-thirds of Union Bay.
3. Westmore Slough, west of Stan Sayre's Memorial Park.
4. Lakewood Bay immediately north of Andrews Bay.
5. Mouth of Mercer Slough.
6. South end of Cozy Cove.
7. Southern half of Yarrow Bay.
8. Northeastern and eastern portions of Juanita Bay.

3.2.2 Lilies

1. At Kenmore between 58th and 60th Avenues Northeast.
2. North of Madison Park, south of SR 520, west of 41st Avenue East, and east of 38th Avenue East.
3. In the south end of Andrews ay.
4. On the north shore of Merce Island, east of Southeast 26th Street.

5. In the south end of Cozy Cove.
6. Along the west shore of Yarrow Bay.
7. In the southeast quarter of Juanita Bay.

3.2.3 Rushes

1. Adjacent Mt. Baker Park, south of Bayview Street and north of South McClellan Street.
2. Adjacent Mt. Baker Park, at the level of South Ridgeway Place.
3. Adjacent Mt. Baker Park, just north of South Horton Street.
4. Adjacent Mt. Baker Park, between South Dakota and South Adams Streets.
5. Adjacent Mt. Baker Park, between South Alaska and South Ferdinand Streets.
6. Periodically adjacent Mt. Baker Park at the level of South Dawson Street.
7. Just north of the dock storage area in Andrews Bay.
8. At the northwestern tip of Seward Park (Bailey Peninsula).
9. Along the west shore opposite South Eddy Street.
10. Along the southwest shore of Mercer Island between Pear Tree Lane and Southeast 71st Street.
11. On the north shore of Mercer Island slightly southeast of Luther Burbank Boys School (aban.)
12. On west shore of Evergreen Point west of Fairweather Lane.

3.2.4 Cattails*

1. At mouth of Sammamish River.
2. Mouth of Thornton Creek.
3. Western margin of Lakewood Bay.
4. Southeastern margin of Andrews Bay.

5. North shore of bay at Atlantic City Park.
6. Surrounding small island near Washington Beach Park.
7. On east shore of East Channel at north city limits of Renton.
8. Mouth of Mercer Slough.
9. Southeast corner of Meydenbauer Bay.

3.2.5 Woody Debris

1. On west shore east of East Edgewater Place.
2. East shore at Washington Beach Park.
3. Southeast shore of Juanita Bay.

3.2.6 Class I and/or II Largemouth Bass Habitat**

1. North shore between Kenmore Air Harbor and 58th Northeast.
2. West shore between Northeast 140th and 42nd Place Northeast.
3. West shore between Northeast 95th and Northeast 93rd.
4. West shore between Thornton Creek and Northeast 90th Place.
5. West shore between 64th Northeast and Northeast 47th.
6. West shore between Northeast 45th and Northeast 44th
7. West shore east of 3100 block of East Laurelhurst Drive Northeast.
8. Northwest shore of Union Bay between 38th Northeast and the Montlake cut.
9. South shore of Union Bay between the Montlake cut and 38th East.
10. West shore between South Fontanelle Place and South Austin Street.
11. Pritchett Island Beach.
12. Southern half of west shore at Atlantic City Park.
13. West shore between South Gazelle and South Norfolk Streets in Rainier Beach.
14. East shore between Northeast 16th and Northeast 27th Court in Renton.

15. East shore between North 33rd and North 35th of Kennydale.
16. East shore between May creek and north city limits of Renton.
17. East shore between Southeast 49th Street and Southeast 45th Place.
18. East shore between Skagit Key and Southeast 40th Street.
19. East shore between Southeast 6th and 95th Southeast.
20. Southeastern end of Meydenbauer Bay.
21. Groat Point.
22. East shore between Northeast 26th and somewhat north of 78th Place Northeast.
23. Evergreen Point.
24. Southern end of Fairweather Bay.
25. Southern arm of Cozy Cove.
26. Juanita Point.
27. East shore from terminus of 62nd Northeast to Squak Slough.

3.2.7 Documented Spiny-Ray Habitat

In addition to the flora documented above and the bass habitat zones delimited by Stein (1970), the reports of various authors have collectively implicated the following lake regions as being important habitat for the species listed:

Location	Species Observed	Authorities
Sammamish River mouth; north shore at Kenmore	brown bullhead	Imamura 1975
	yellow perch	Lindsey 1971
	largemouth bass	Stein 1970, Lindsey 1971
	black crappie	Tagart 1973, Lindsey 1971
	pumpkinseed sunfish	Lindsey 1971

Location	Species Observed	Authorities
Matthews Beach	yellow perch	Lindsey 1971
	smallmouth bass	Ibid.
Pontiac Bay	yellow perch	Shepard 1975
	largemouth bass	Ibid., Stein 1970
	black crappie	Shepard 1975
	brown bullhead	Ibid.
	pumpkinseed sunfish	Ibid.
	smallmouth bass	Ibid.
Union Bay	black crappie	Tagart 1973
	largemouth bass	Stein 1970
	brown bullhead	Imamura 1975
	yellow perch	Bartoo 1972
Mercer Slough	brown bullhead	Imamura 1975
	yellow perch	Lindsey 1971, Bartoo 1972
	largemouth bass	Stein 1970
	black crappie	Tagart 1973
Meydenbauer Bay	black crappie	Tagart 1973
	largemouth bass	Stein 1970
Cozy Cove	largemouth bass	Stein 1970
	Black crappie	Tagart 1973

Location	Species Observed	Authorities
Yarrow Bay	black crappie	Walden 1969, Tagart 1973
	largemouth bass	Stein 1970, Walden 1969
	yellow perch	Walden 1969
	pumpkinseed sunfish	Ibid.
	brown bullhead	Ibid.
Juanita Bay	black crappie	Tagart 1973
	largemouth bass	Stein 1970
	yellow perch	Bartoo 1972

It should be noted that all areas highlighted or delimited on the maps appended are also suitable habitat for cutthroat trout, particularly where vegetation overhangs the water surface and depths are moderate near shore.

3.3 Recommendations Regarding Shoreline Development

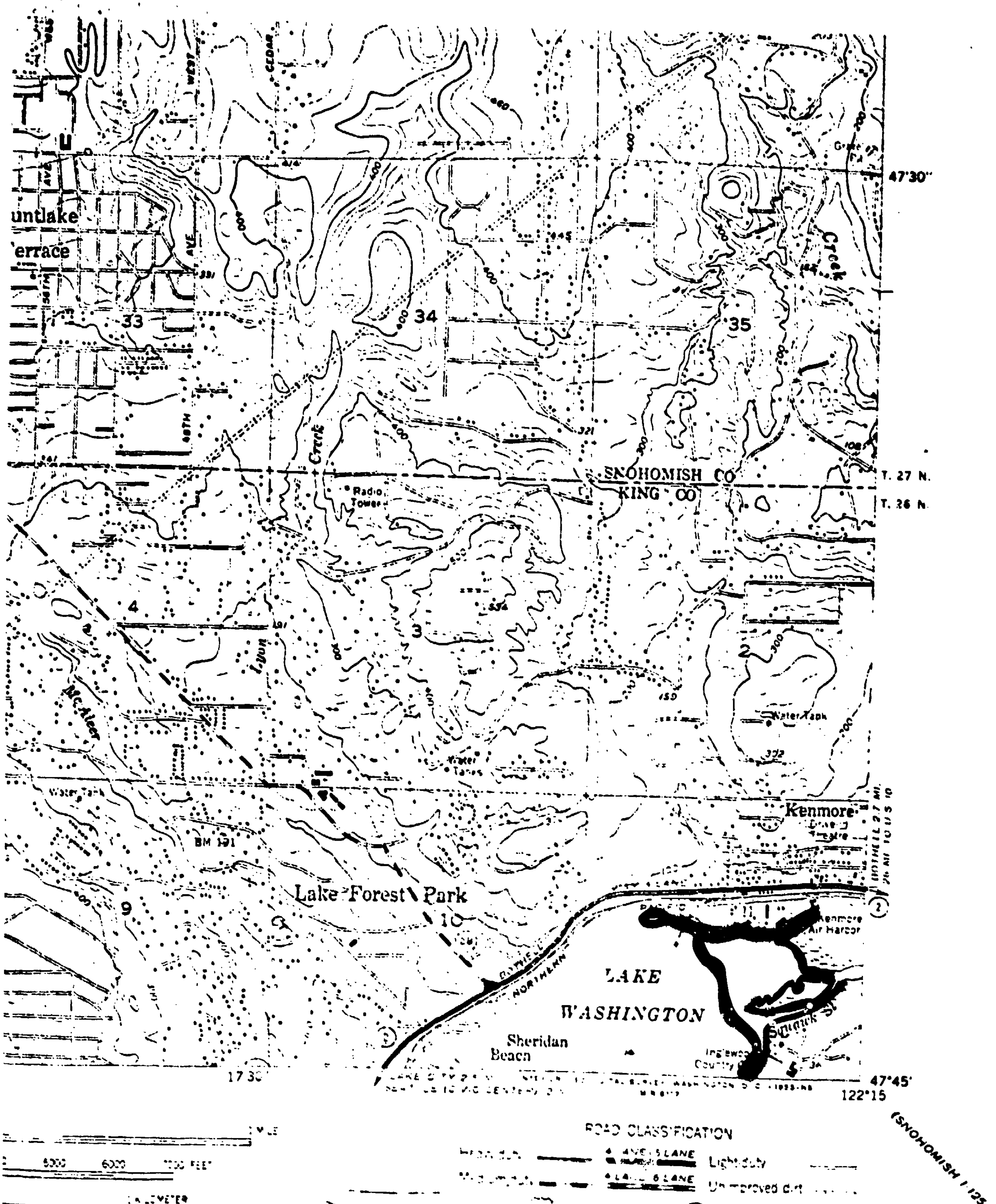
The literature and shoreline surveys indicate that a substantial amount of game fish habitat remains around Lake Washington, especially for spiny-ray species. The most important areas are Sammamish River mouth - Kenmore, Matthews Beach, Union Bay, Andrews Bay (both north and south), Mercer Slough, Meydenbauer Bay, Cozy Cove, Yarrow Bay, and Juanita Bay. There are other local accumulations of vegetation and/or debris which are important fish habitat as well (Appendix maps).

Preservation of this habitat will require at a minimum scrupulous monitoring of all new development through existing interagency mechanisms. Where socioeconomic forces override the intrinsic need for such preservation, various regulations will have to be imposed to prevent or mitigate habitat or resource losses.

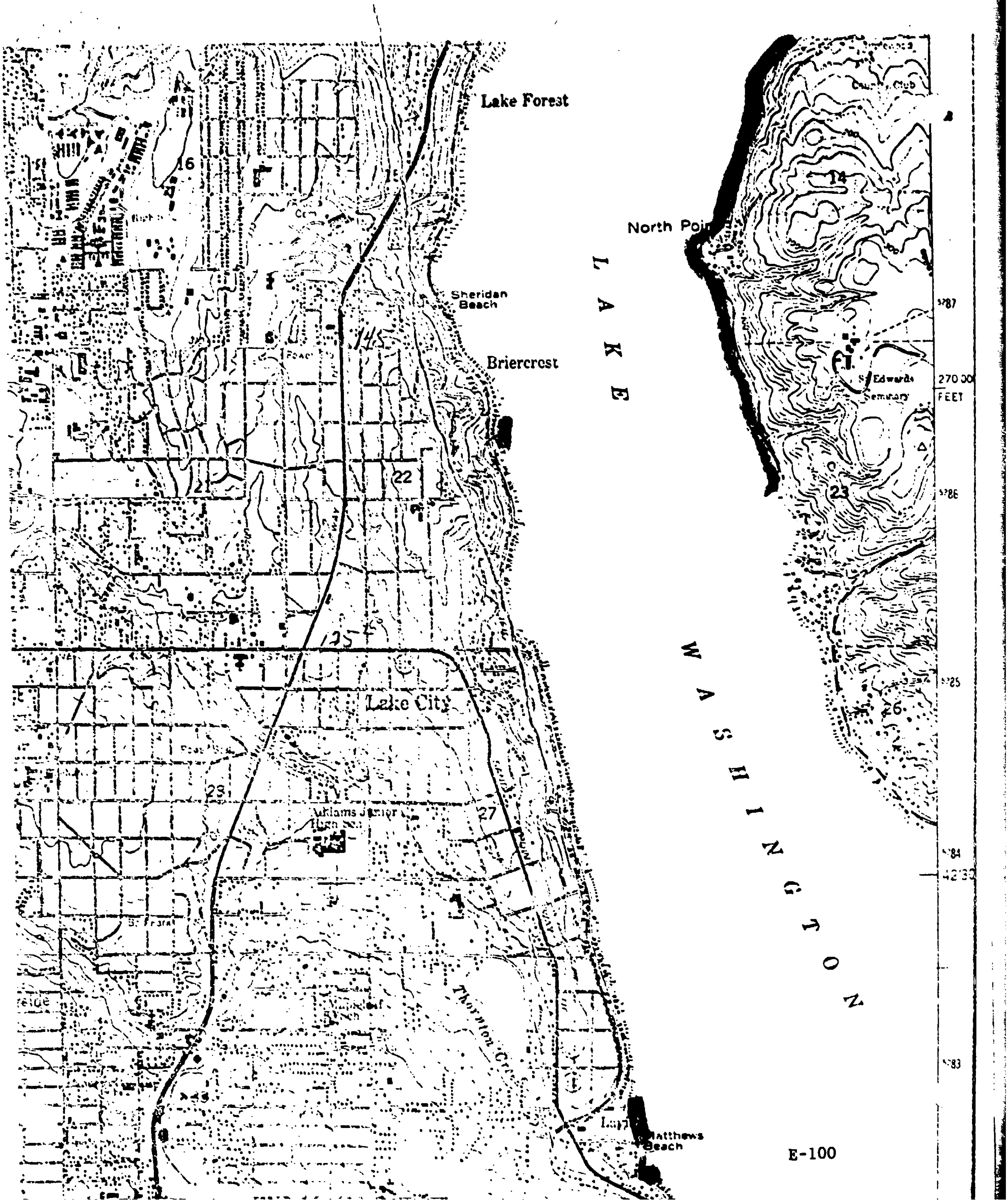
5.0 APPENDIX

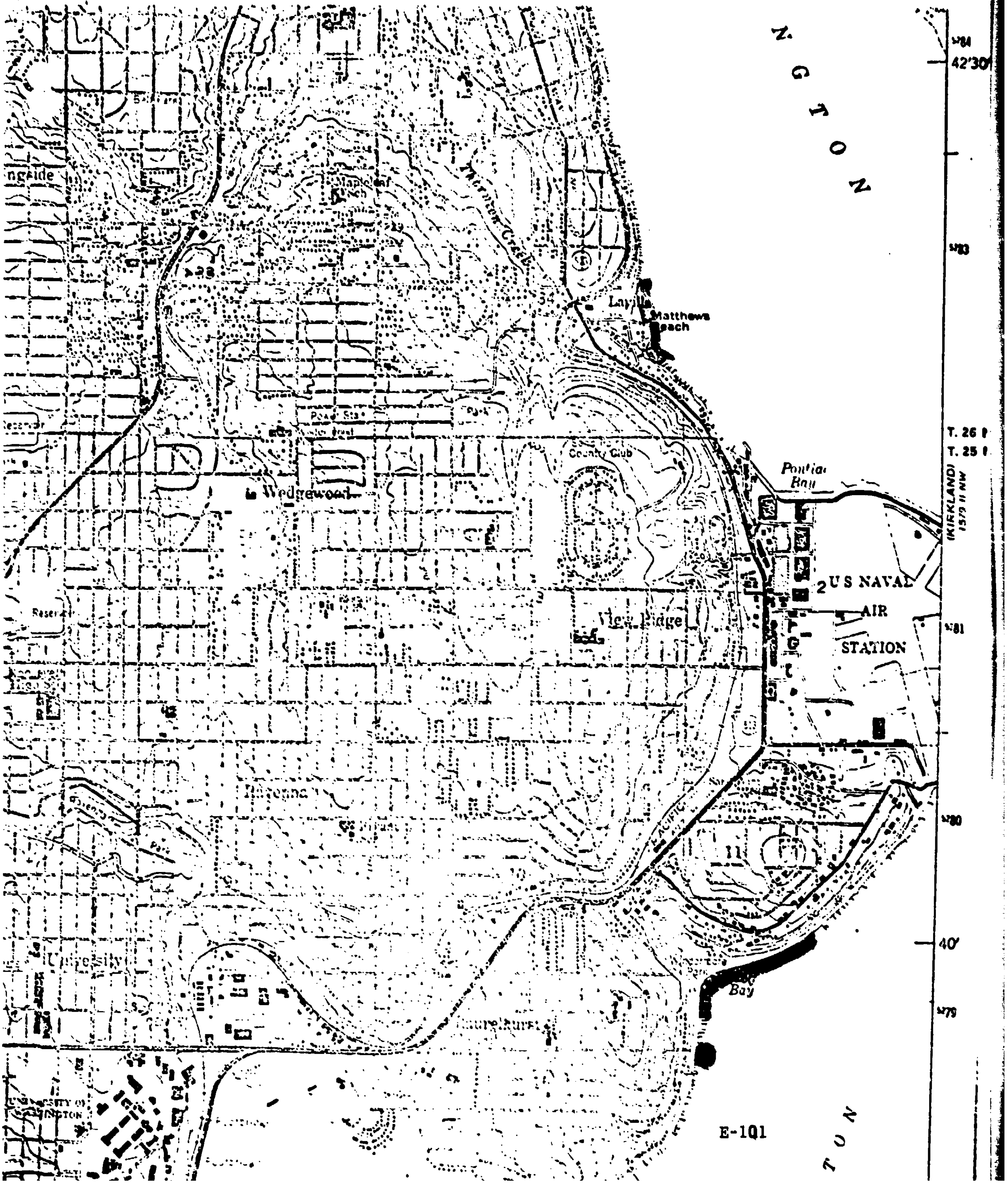
Shoreline flora, debris, and largemouth bass habitat were denoted on the following maps according to the legend given below.

Color Code	Shoreline Feature
	rooted submerged aquatic vegetation
	lilies
	rushes
	cattails; only where roots exposed to shallow water
	partly submerged woody debris
	Class I and/or II largemouth bass habitat



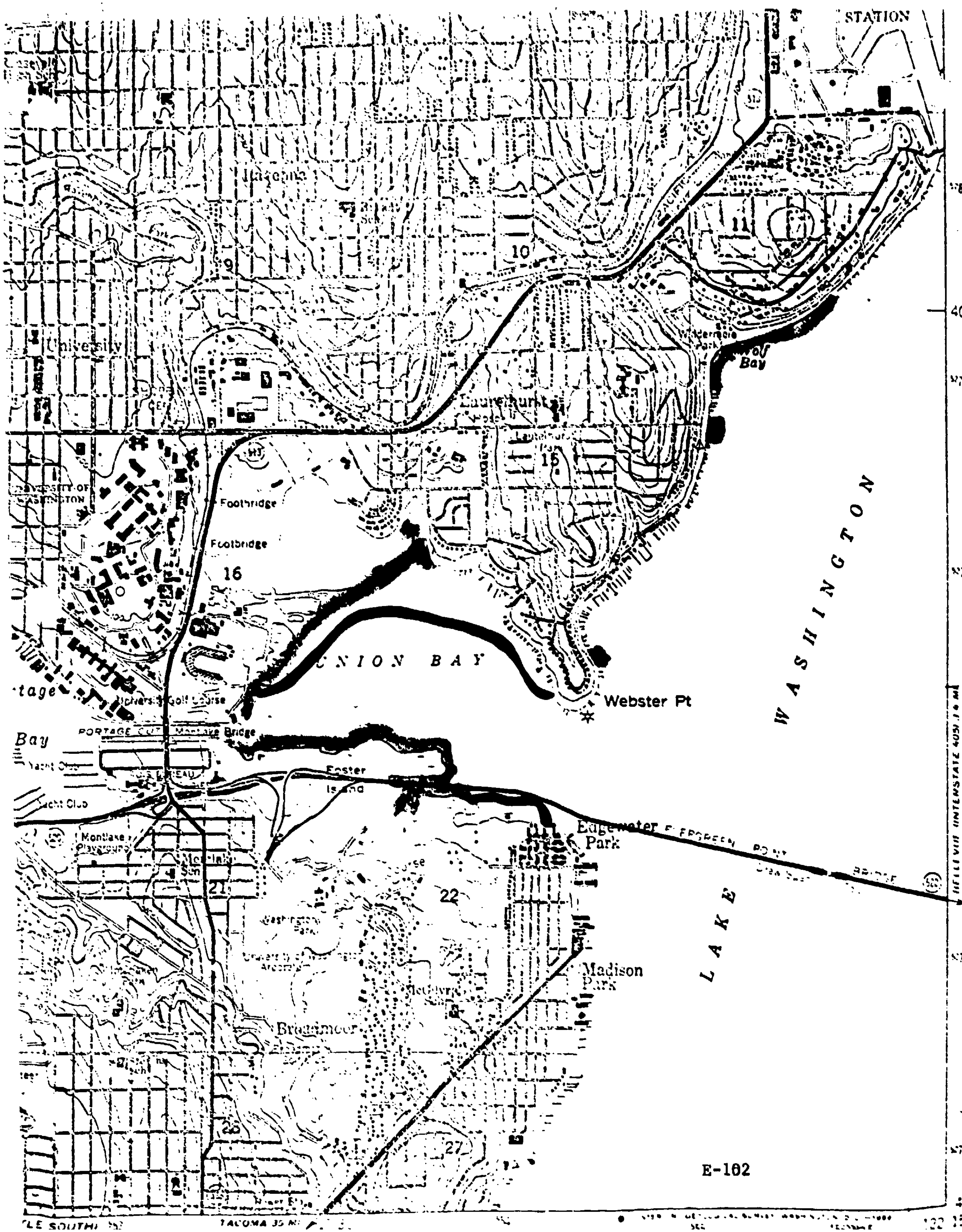
untlake
'errace
33
34
35
Creek
SNOHOMISH CO
KING CO
T. 27 N.
T. 26 N.
47'30"
Radio Tower
Creek
4
3
2
Lyon
McAleer
Water Tank
Water Tanks
Kenmore
BM 191
Lake Forest Park
9
10
LAKE
WASHINGTON
Sheridan Beach
Kenmore Air Harbor
47°45'
122°15'
ROAD CLASSIFICATION
Light-duty
Unimproved dirt
State Route
(SNOHOMISH 1:125,


Lake Forest
Sheridan Beach
Briercrest
LAKE
WASHINGTON
Lake City
Thornton Cr
Matthews Beach
St Edwards Seminary
270 000 FEET

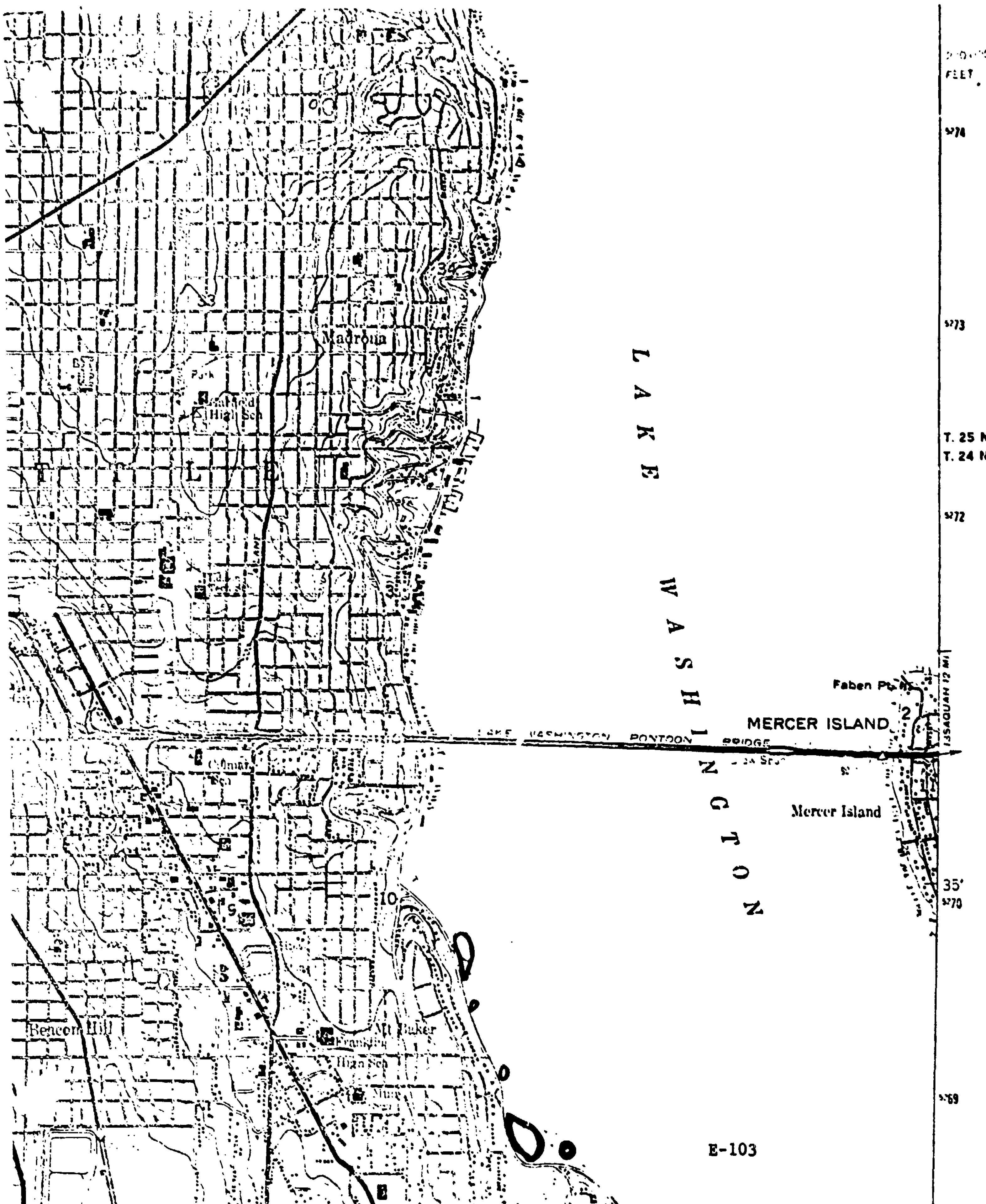


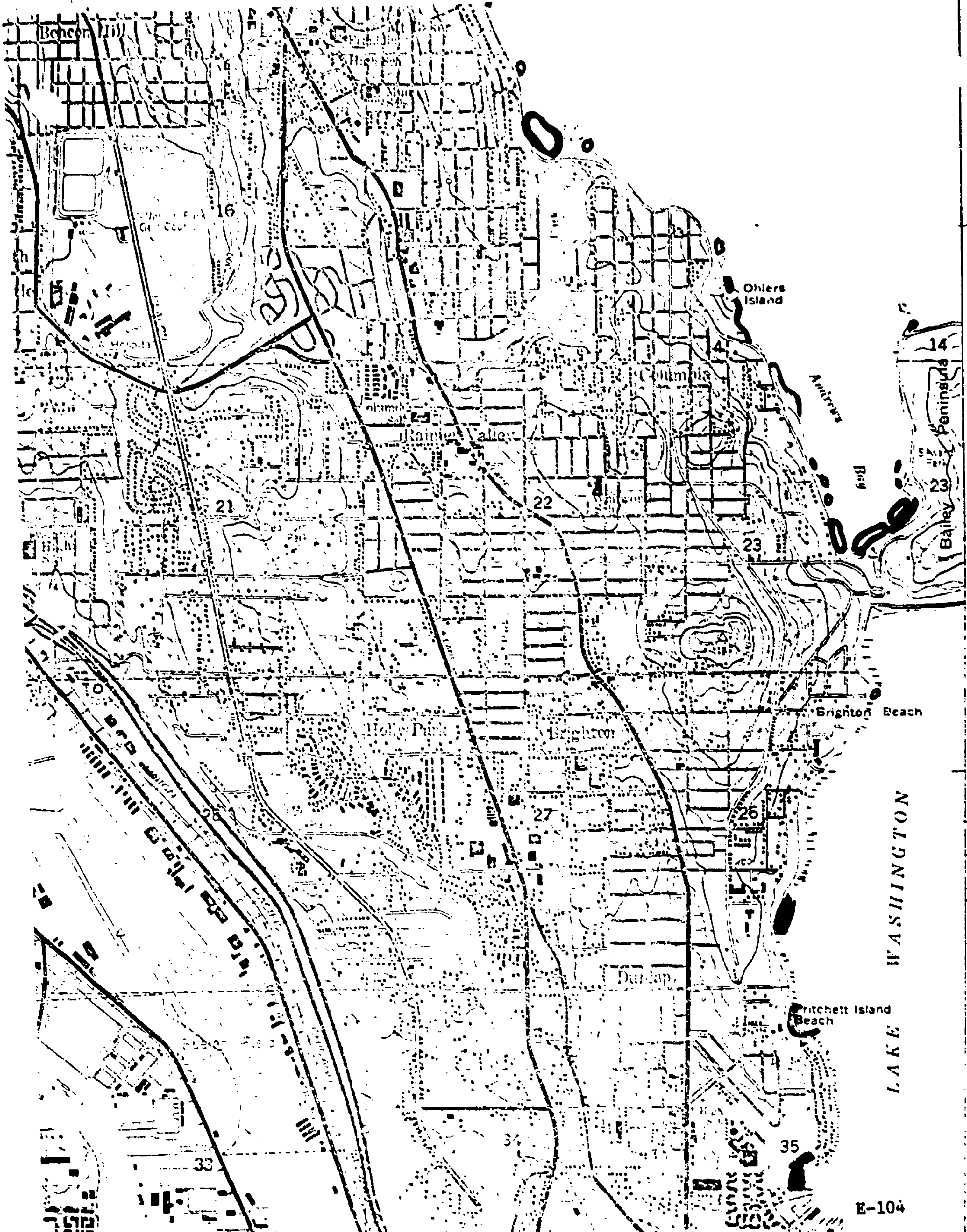
42'30"
Matthews
Beach
Country Club
Pontiac
Bay
Wedgewood
US NAVAL
AIR
STATION
View Ridge
T. 26
T. 25
(KIRKLAND)
40'
Bay
University

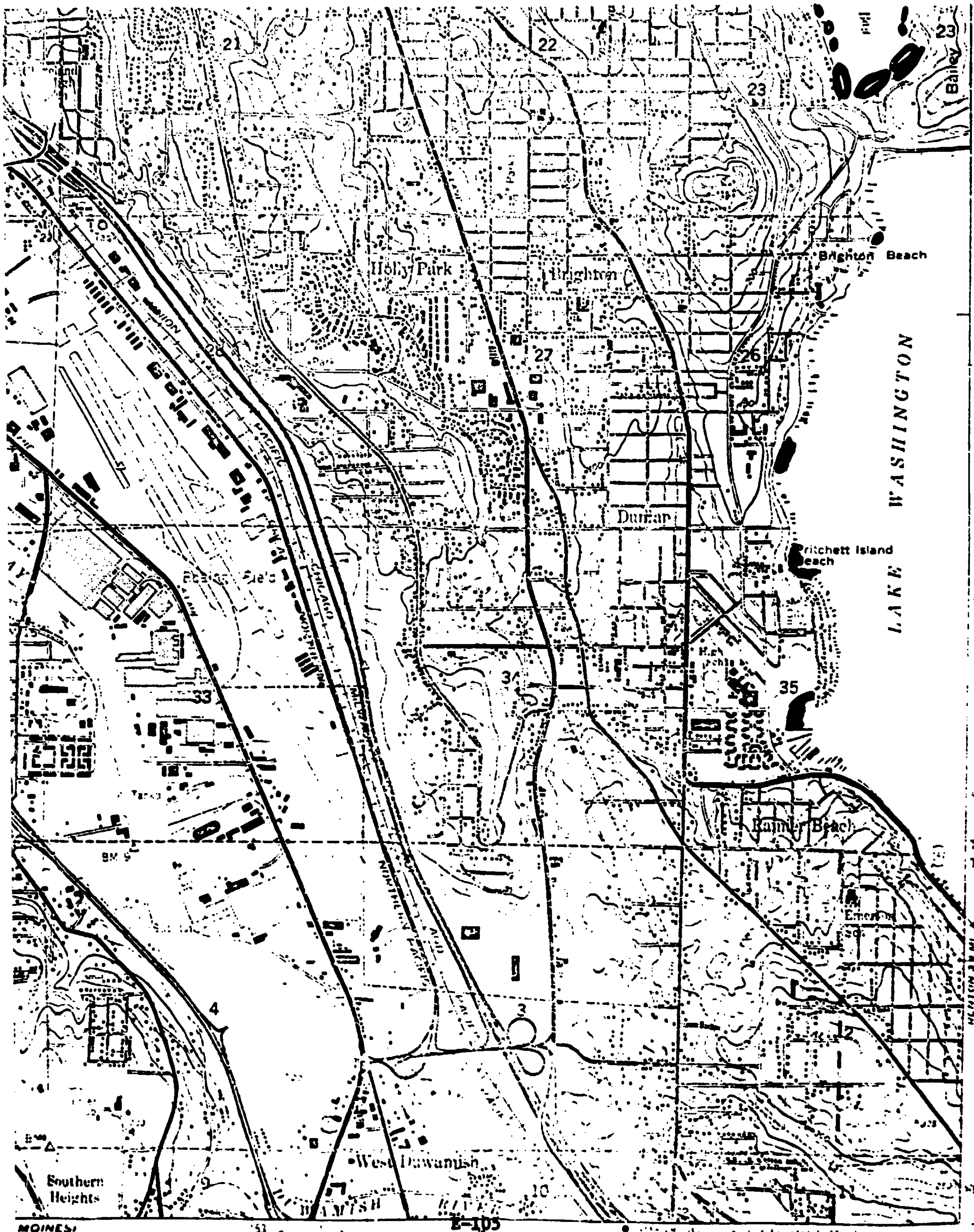
E-101

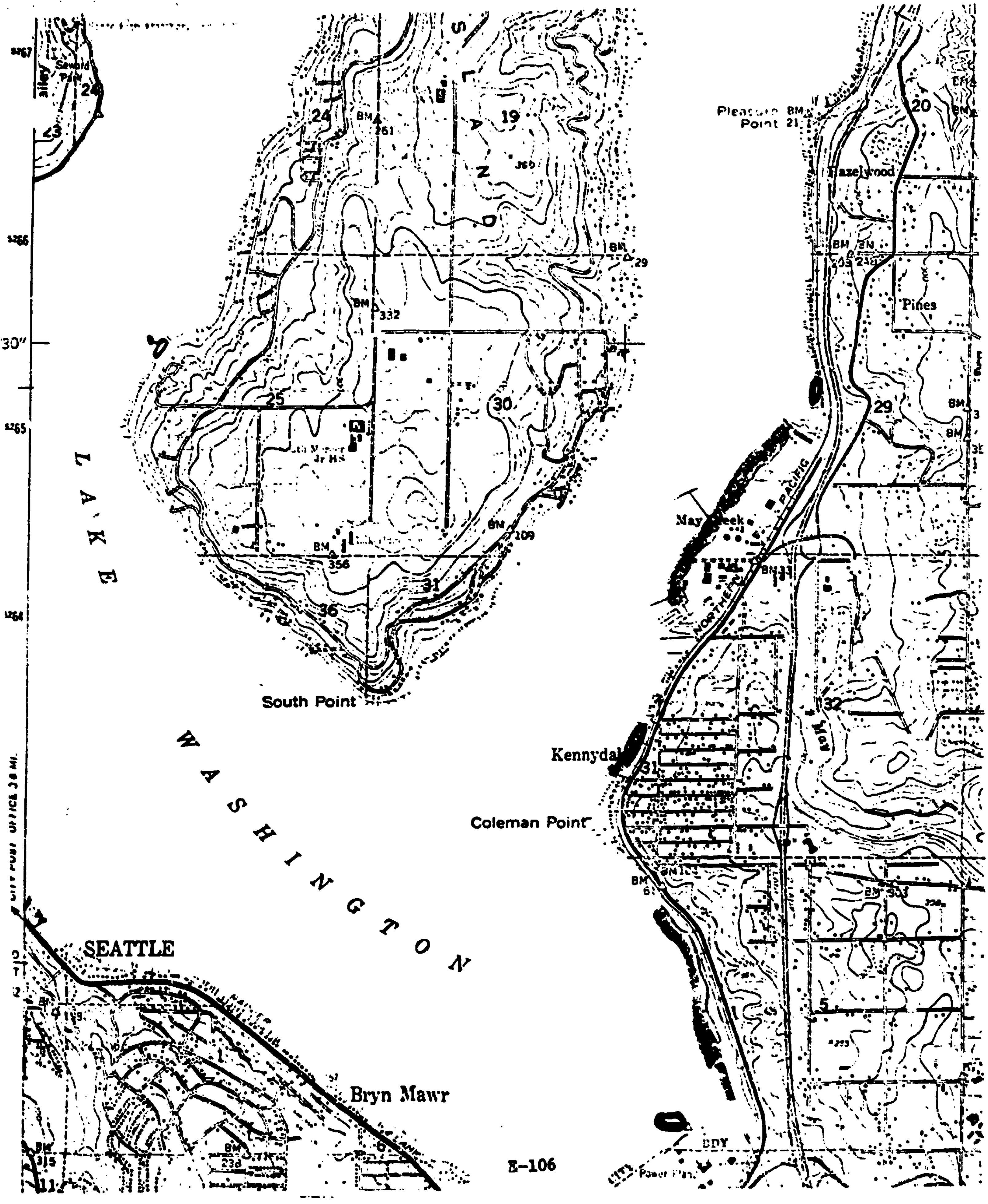

STATION
University
Laurelhurst
10
9
11
Bay
Footbridge
Footbridge
16
15
UNION BAY
Webster Pt
WASHINGTON
Bay
PORTAGE CUT
Montlake Bridge
Yacht Club
Foster
Island
Yacht Club
Edgewater
Park
Montlake
Playground
21
22
LAKE
Madison
Park
Washington Park
Broadmoor
27
TACOMA 35 MI

E-182

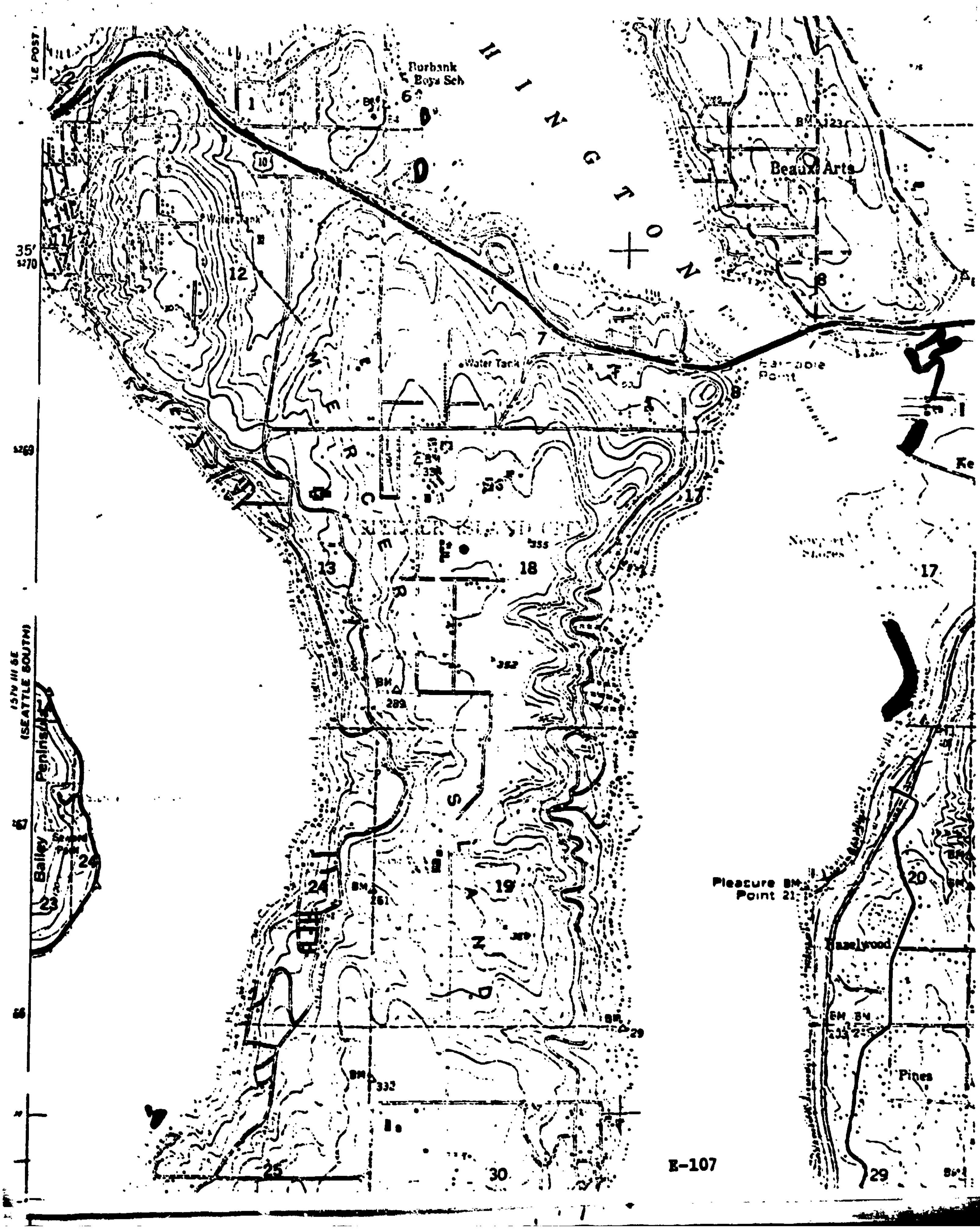

LAKE WASHINGTON
MERCER ISLAND
Mercer Island
Faben Pt.
LAKE WASHINGTON PONTOON BRIDGE
Madrona
Garfield High Sch
Colman Sch
Beacon Hill
Mt Baker
Franklin High Sch
T. 25 N.
T. 24 N.
5273
5272
5270
5269
35'
FEET


Beacon Hill
Ohlers Island
Columbia
Rainier Valley
Andrews Bay
Bailey Peninsula
MERCER ISLAND
Brighton Beach
Holly Park
Brighton
Dunlap
Pritchett Island Beach
LAKE WASHINGTON
16
21
22
23
14
26
27
28
33
35

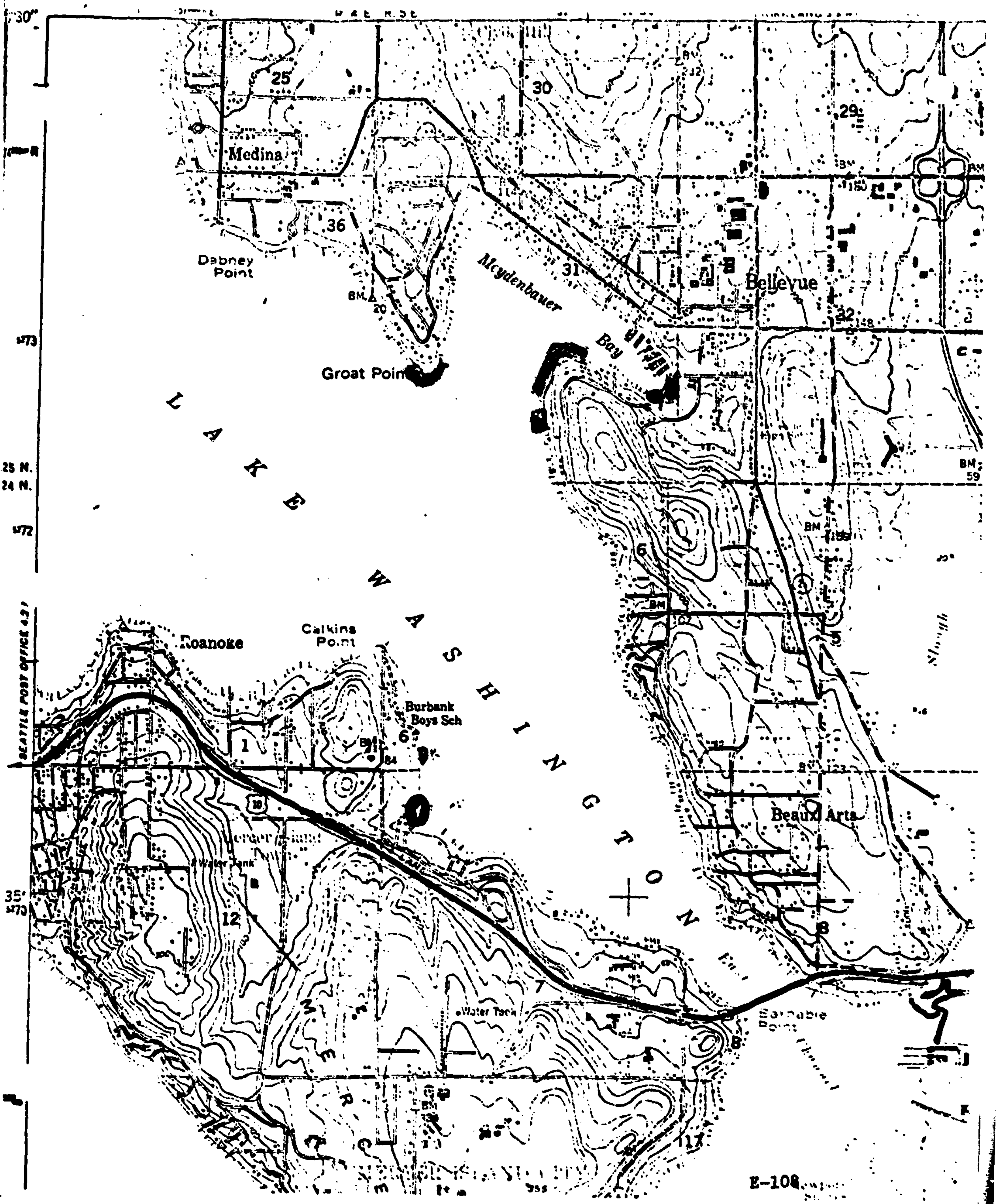

Holly Park
Brighton
Brighton Beach
LAKE WASHINGTON
Dunlap
Pritchett Island Beach
Rainier Beach
Bailey
Boeing Field
UNION PACIFIC
CHICAGO
West Duwamish
Southern Heights
T. 24
T. 23
21
22
23
26
27
28
33
34
35
3
4
9
10
12
32'30"


LAKE WASHINGTON
South Point
Pleasure Point
Hazelwood
Pines
May Creek
NORTHERN PACIFIC
Kennydale
Coleman Point
SEATTLE
Bryn Mawr
Seward Park
Mercer Jr HS
Power Plant
BDY

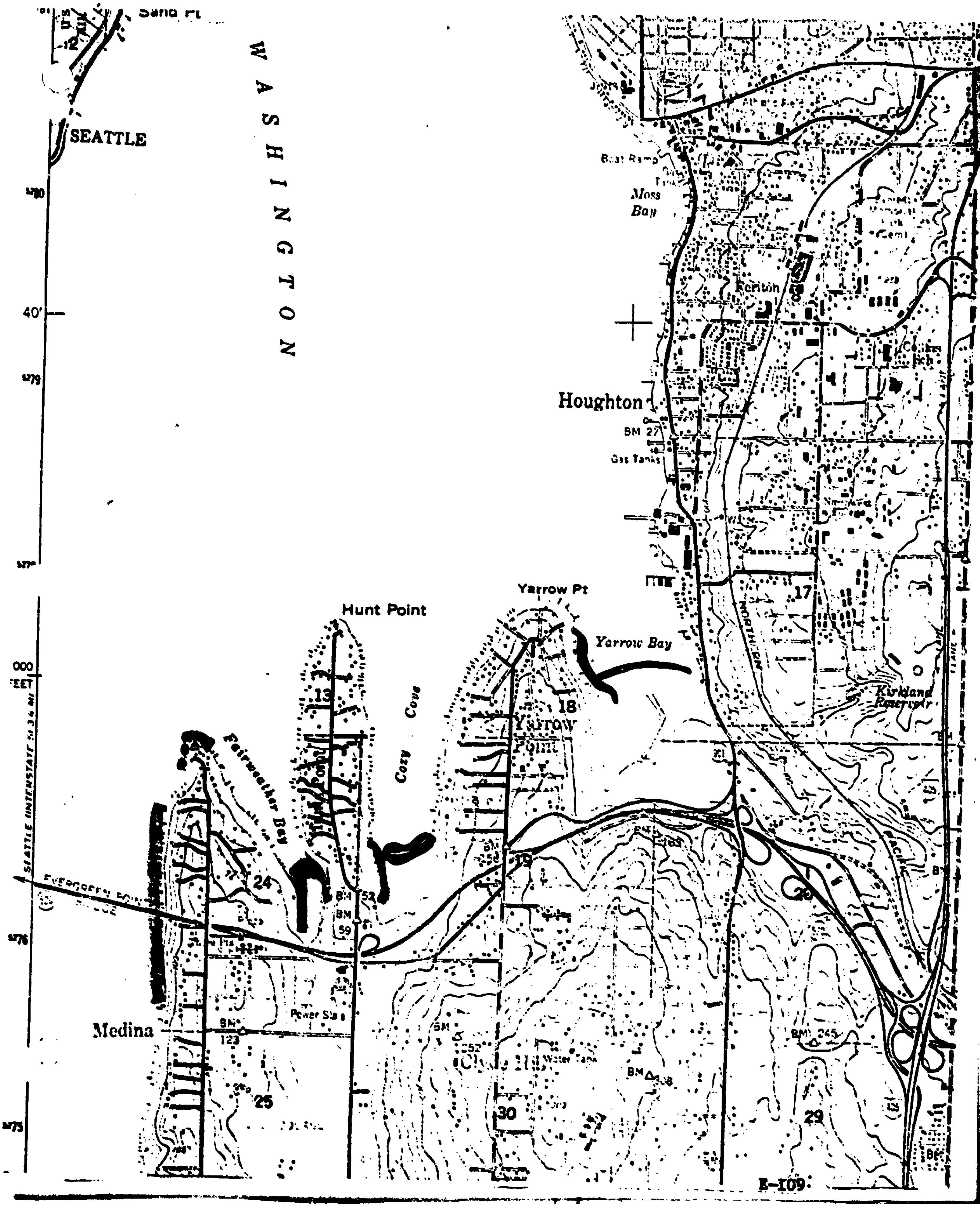
E-106


Burbank
Boys Sch
Beaux Arts
Water Tank
Pleasure
Point
Hazelwood
Pines
Bailey
Peninsula
(SEATTLE SOUTH)
35'

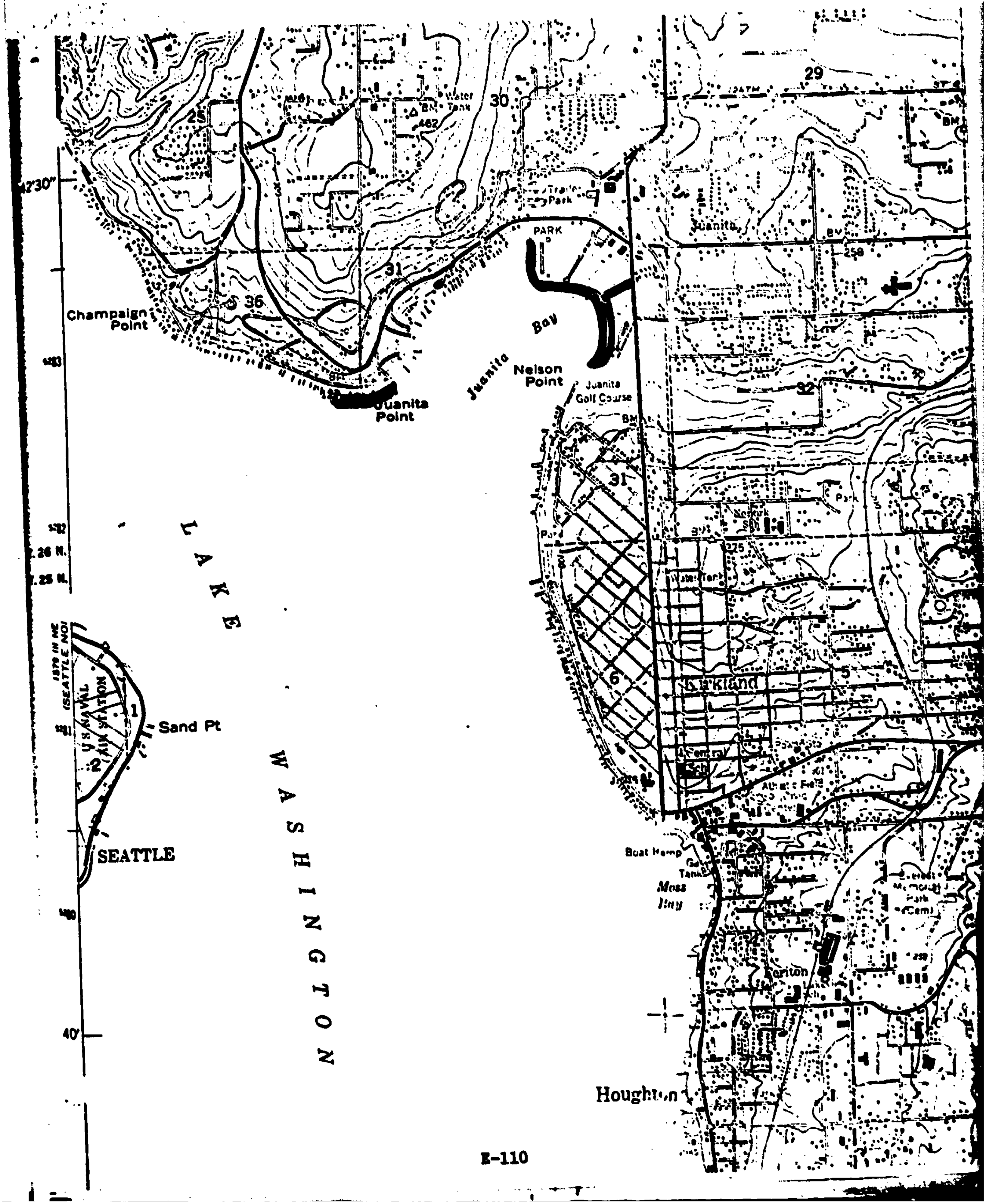
E-107


Medina
Dabney Point
Groat Point
Meydenbauer Bay
Bellevue
LAKE WASHINGTON
Roanoke
Calkins Point
Burbank Boys Sch
Beaux Arts
Barnabie Point
Water Tank
SEATTLE POST OFFICE 4.2 MI
25 N.
24 N.

E-108



Sand Pt
SEATTLE
WASHINGTON
40'
Houghton
Moss Bay
Boat Ramp
BM 27
Gas Tanks
Yarrow Pt
Yarrow Bay
Hunt Point
Cozy Cove
Fairweather Bay
Yarrow Point
Kirkland Reservoir
17
18
13
24
19
20
25
30
29
Medina
Power Sta
Water Tank
BM 52
BM 59
BM 123
BM 245
BM 408
EVERGREEN POINT BRIDGE
SEATTLE (INTERSTATE 5) 3.6 MI
NORTHERN
PACIFIC
E-109


Champaign Point
Juanita Point
Juanita Bay
Nelson Point
Juanita Golf Course
PARK
Juanita
Trailer Park
Water Tank
LAKE WASHINGTON
Sand Pt
U S NAVAL AIR STATION
SEATTLE
Kirkland
Central Sch
Athletic Field
Boat Ramp
Moss Bay
Houghton
40'

STATE OF WASHINGTON

Department of

Natural Resources

COMMISSIONER
BERT L. COLE

R. A. BESWICK
SUPERVISOR

OLYMPIA, WASHINGTON
98504

August 20, 1979

Barbara Ritchie
Environmental Review Section
Department of Ecology
St. Martins College
Lacey, Washington

Re: Corps of Engineers' Draft EIS for
Aquatic Plant Management Program

Dear Ms. Ritchie:

We have reviewed the above EIS and find that one environmental element, phytoplankton, has not been addressed. Even though the proposed control program is aimed primarily as a maintenance function, in lieu of total eradication, we would like to see a discussion of the possible effects of chemical control on phytoplankton and related food chains. This should be addressed in Sections 2.02.7 and 4.04.5.

Further, we wonder what happens to the milfoil remain after the plants have been killed by chemical treatment. Will plant remains wash ashore and cause odor and fouling problems?

We appreciate the opportunity to review this EIS.

Very truly yours,

BERT L. COLE
Commissioner of Public Lands

Thomas F. Mumford Jr.

TOM MUMFORD, Ph.D
Algologist
Marine Research & Development

TM/nr

STATE OF
WASHINGTON

Dixy Lee Ray
Governor

DEPARTMENT OF TRANSPORTATION
Highway Administration Building, Olympia, Washington 98504 206/753-6005

August 21, 1979

Ms. Barbara Ritchie, Review Section
Department of Ecology, PV, II
Olympia, Washington 98504

U.S. Army Corps of Engineers
Aquatic Plant Management Program
Draft Environmental Compact Statement

Dear Ms. Ritchie:

We have reviewed the subject document and have no comments to offer regarding the proposal.

Thank you for the opportunity to review this information.

Sincerely,

ROBERT S. NIELSEN
Assistant Secretary
Public Transportation and Planning

Wm P Albohn

By: WM. P. ALBOHN
Environmental Planner

RSN:bk
WPA:WBH

cc: R. Albert
J. D. Zirkle
D. P. Swanson
Environmental Section

GREENPEACE SEATTLE

COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT ON THE AQUATIC PLANT MANAGEMENT PROGRAM PREPARED BY THE U.S. ARMY CORPS OF ENGINEERS, SEATTLE DISTRICT.

The draft environmental impact statement prepared by the Seattle District of the U.S. Army Corps of Engineers shows that the proposed treatment of Washington State waters with herbicides, particularly the phenoxy herbicide 2,4-D, is in great need of reconsideration. The D.E.I.S. does not take into sufficient account the viable existent alternatives to 2,4-D application, but seems to recommend the use of the herbicide based on the desires of a few property owners. The larger concern for public health is neglected in the document; so-called "cost-effectiveness" appears to be the primary reason behind the recommendation of 2,4-D application to control Eurasian watermilfoil.

According to the D.E.I.S., areas where heavy concentrations of milfoil occur should be targeted for 2,4-D application, but nowhere in the draft is there an explanation of what conditions constitute a heavy infestation. Also lacking are reports on the actual extent of milfoil infestation in the bodies of water proposed for treatment. Before any recommendation for spraying is made, in-depth studies of the particular sites should be made. Recommendations should be drawn from such research, not from studies on sites elsewhere in the continent, since each site has conditions which may radically differ from other sites.

Page 28 (1.05.4 Benefit/Cost Analysis of the Control Program) contains a sentence which summarizes the prime reason for the 2,4-D treatment: "Therefore, the cost of the most likely, least cost alternative that land owners would invest in, in the absence of a Federal program that would provide the same level of control,are considered to the benefits for the nonpublic areas." Because land owners would rather invest in the cheapest available means of milfoil control is no reason to recommend herbicides for milfoil treatment. The emphasis on "benefits for the nonpublic areas" is misleading, for it implies that herbicides will remain in treatment areas only, and does not take into account current and tidal distribution of herbicides to non-sprayed areas accessible to public use.

4534½ University way, Seattle, Wa. 98105, 632-4326

The D.E.I.S. also maintains that "There has never been any indication that 2,4-D, in concentrations used for aquatic plant control, would cause public health problems" (Page 59, 4.08.2 2,4-D), and further states, "None of the control or prevention alternatives should have any effect on human population" (Page 59, 4.11, Impacts on Human Population). These statements are in contradiction to several studies on the mutagenic effects of 2,4-D. One study, which is not even listed in the D.E.I.S. bibliography (Courtney, K. Diane. "Prenatal Effects of Herbicides: Evaluation by the Prenatal Development Index." 15th Annucal Meeting of the Teratology Society, May 11-14,1975), states that the greatest mutagenic effects of 2,4-D are "produced at the low doses administered over long time periods." The 2,4-D applications recommended in the D.E.I.S., though presented as a single series of separate treatments, would probably be followed by further recommendations for 2,4-D applications in successive years. Repeated applications of 2,4-D present dangers to fetuses, dangers which may be present in even a single spraying.

It is surprising that the Corps is recommending 2,4-D and deemphaisizing aquascreens and mechanical harvesting, particularly when Seattle Metro is working on feasibility studies of these methods. Reports from Mike Perkins, who has supervised the Metro project, reveal that a combination of the two methods is extremely efficient in controlling milfoil. The D.E.I.S. contains virtually nothing on this project. Before a final herbicide recommendation is even considered, more available knowledge of alternatives and their effectiveness should be studied, and real consideration of studies which show 2,4-D to be a health hazard should be made.

prepared by Craig Allan Thompson, Greenpeace Seattle

4314 Island Crest Way
Mercer Island, Wa, 98040
September 3, 1979

Corps. of Engineers, U. S. Army
P. O. Box C3755
Seattle, Wa.

ATTN: BOB RAWSON
SUBJECT: AQUATIC PLANT MANAGEMENT PROGRAM
DRAFT ENVIRONMENTAL IMPACT STATEMENT

Gentlemen;

I have carefully studied the subject Draft Environmental Impact Statement.
All possible effects of the proposed programs have apparently been explored except those upon the bodies of the humans who move upon, into and under the waters upon which the studies have been made.

The possibility that humans could ingest some of the herbicides into their systems via absorption through the skin, through the mucuous membranes, or directly into the several orifices of their bodies was not mentioned and obviously has not been explored.

Before any chemicals are mixed into the waters of any stream or lake, we should know what effect they will have upon our whole ecological system. Humans are a part of the ecological system.

One possible cause of the extraordinary growth of the milfoil in the mentioned lakes and waterways is the continuous supply of rich nutrients that originates nearby, upstream, or up the water table.

In the case of lakes whose shores are populated the following simple process occurs:

I. Fertilizer is spread upon a lawn or other plant life. It is watered in with copious amounts of water.

II. The water enters the water table and migrates downslope into the lake. This water can upwell as much as 50 feet or more from shore.

III. The highly nutrient water flows past the plants and they, in turn, grow profusely.

The same process occurs in rivers and lakes which are supplied by seepage from commercial agricultural fertilization.
No amount of herbicide application, mowing, or putting down of netting will control aquatic plants as long is these endless supplies of nutrients are available.
If care is exercised in the application of both domestic and commercial fertilizers we will solve the problem of excess aquatic growth without resorting to drastic measures.

Yours, very truly,
Walbridge J. Powell
Walbridge J. Powell

Seattle Audubon Society

A Washington Chapter of National Audubon Society

714 Joshua Green Building • Fourth Avenue and Pike St., Seattle, Wash. 98101 • (206) 622-6695

September 13, 1979

Col. Leon K. Moraski,
Seattle District Engineer
Army Corps of Engineers
P.O. Box C-3755
Seattle, Washington 98124

Re: Draft Environmental Impact Statement, Aquatic Plant Management Program, State of Washington

Dear Col. Moraski:

Seattle Audubon Society (SAS) is a 3,800 member chapter of a national conservation organization. On behalf of that chapter, we are submitting the following statement which is an extention on remarks read into the record at the September 4, 1979 public hearing. We are prepared to substantiate these comments and, on request, would be happy to supply data to you.

SAS supports portions of the Corps' draft; specifically, bottom screening in locations of high use such as swimming beaches and in limited access areas such as under docks, plus mechanical harvesting.

MECHANICAL HARVESTING

Mechanical harvesting has been used in lakes and waterways in Ontario, British Columbia and Wisconsin without significantly impacting fish and wildlife (Wile, 1978. Environmental effects of Harvesting. J. Aquat. Plant Management - from the COE bibliography - plus several references in the bibliography of Warnock et al, 1978, "The Other Face of 2,4-D, A Citizen's Report", South Okanogan Environmental Coalition.) For the final EIS we request that the Corps include data reflecting greater serious research into mechanical harvesting, including examples of where it has been used successfully.

No information is given in the DEIS comparing costs of mechanical and chemical control. The DEIS states (page 60) that "many property owners....feel that chemical control is the most effective and the least expensive available." Is this feeling justified? Perhaps the homeowners have felt that they had only a chemical option. By closely reading the DEIS, it indicates that mechanical harvesting is as effective as chemical control. This comparative information needs to be drawn together and presented with accurate cost data that reflects the local area, including the importance of salmon as it is impacted by chemical controls. Mechanical harvesting cost estimates from other parts of the country reflect a range from $70 to $150 / acre (Smith, Gerald N. 1979. "Recent Case Studies of Macrophyte Harvesting Costs - Options

by Which to Lower Costs". Aquatic Control Technology, Inc., Wayland, Mass.). Other sources extend this range greatly (personal verification, Washington Environmental Council). In the final EIS harvesting costs must be clearly defined and compared to equally clearly defined costs of chemical control.

We request that the Corps reconsider the usefulness and disposal of harvested milfoil. In 1977 the Ontario Agriculture College reported that harvested milfoil from their control program was composted. The resultant potting soil is packaged and sells well on the Ontario market ("Nutrition from a Nuisance". Ontario Agric. College Alumni News, XVI #3, April, 1977). The Wisconsin Department of Natural Resources reported that in 1978 local gardeners in Madison willingly removed and used all available harvested plants (personal communication Dunst-Edmondson). Dried, composted milfoil is reported in the draft (page 11) as having an N-P-K content of 3-2-5. This is higher than the 1-1-1 content of composted steer manure - a soil conditioner/fertilizer used widely (Country Journal, July 1979, page 54, "The Relative Worth of Compost Materials"). Given the preponderence of home and truck gardening in the Seattle area and the anticipated cooperation of local environmental and agricultural organizations in coordinating aquatic plant disposal/composting efforts, the disposal "problem" could in fact become a benefit.

In light of the above information on mechanical harvesting, we are concerned that the emphasis of the DEIS appears to be on chemical control. Information on harvesting is scattered throughout the document with no mention in an appendix of the facts and figures on performance available from existing U.S. and Canadian harvesting programs. The bibliography suggests that much less attention was given to researching harvesting than was given to chemical controls. Until this deficiency is rectified, the draft is inadequate.

We recommend that the Corps, out of concern for availability of harvest equipment (DEIS page 12, paragrph 4), oversee ordering the purchase of a harvesting machine posthaste. Personal communication (9/11/79) with Mike Perkins, principal investigator for the Municipality of Metropolitan Seattle (Metro) milfoil research demonstration project, indicates that harvesting machines are readily available for sale on relatively short notice. Perhaps the State Department of Ecology, as umbrella agency, is the appropriate organization through which this could be accomplished. Other agencies might include municipalities, counties, homeowner associations, waterfront management districts or regional authorities such as Metro. Because lack of availability of harvesters has consistently been an excuse of those who promote chemical control, we urge that the Corps plan for 70% (with 30% local) funding of a harvesting machine.

We wish to carefully clarify that harvesters are readily available for sale, and we urge the Corps to promote such a purchase and include it in the aquatic plant control program for the State of Washington.

BOTTOM SCREENING (vinyl coated fiberglass mesh screening known commercially as Aquascreen)

The DEIS presents bottom screening as the most expensive option; yet there is evidence to the contrary. The final EIS needs to explore and confirm the option of renting bottom screening as well as cost comparisons made at the 9/4/79 public hearing by Jim Carsner of Aquatic Control, Tacoma. Mr. Carsner stated that for the average size homeowner's lot, on a rental basis, bottom screening is below the cost of herbicide treatment for the same area. Mr. Carsner also indicated that the initial purchase option with a maintenance agreement was cost competitive with herbicide costs.

Other points that require clarification or disclosure in the final EIS include
(1) Bottom screening does provide complete control.
(2) Because the total control is provided within a short time (see below), the screen is reusable; i.e., a single panel could be moved from area to area within a single growing season. Thus half or more of the anticipated initial capital cost could be saved.
(3) The City of Seattle is currently using bottom screening at several locations.
(4) The Metro project includes bottom screening.
(5) The DEIS (5.06) states that bottom screening would lead to the elimination of benthic organisms in the food chain. We refer you to remarks made by Mike Perkins at the 9/4 public hearing and to his paper which states, "This material (Aquascreen) appeared particularly attractive since it would allow for dissolved substance transfer at the sediment-water interface and was effective after short periods of coverage" (Perkins, Michael A. et al. 1979. "The Use of Fiberglass Screens for Control of Eurasian Watermilfoil", paper presented 3/79 at Efficacy and Impact of Intensive Plant Harvesting in Lake Management, Madison, Wis. Based on reference to Meyer, J. T. "Aquatic Weed Management by Benthic Semi-Barriers." J. Aquat. Plant Manage., 16.31 (1978).)

The final EIS must include a comparative cost presentation of all proposed control methods. Also, we urge you to coordinate your program with both the Seattle and the Metro work in order to take advantage of their experiences and the bottom screening itself which is already being used.

SAS DOES NOT SUPPORT HERBICIDES

SAS does not support the proposed use of chemicals to control aquatic plants. Such use is an alternative about which we are greatly concerned. While the methods we've outlined above, mechanical harvesting and bottom screening, may have certain restrictions to their use, these are known and can be mitigated or minimized. Long term toxic effects of herbicides on plants, animals and humans, on the contrary, are hotly debated within the scientific community. We believe that while such debate continues unresolved, these chemicals should not be used, especially when cost competitive alternative techniques are available.

Not only do nonchemical alternatives exist, they are being developed locally. Although the Metro milfoil research demonstration project is mentioned in the DEIS, there appears to be no coordination with or capitalization on it.

The Metro literature search on the public health effects of 2,4-D, endothall, diquat and casoron is still in a draft form, and officially the Corps does not have a copy of it. Through computer search, however, the Corps has had access to the studies noted in the Metro search. A comparison of bibliographies of the Metro search and the Corps' DEIS indicates only one source listed by both. We strongly feel that the Corps must, in developing its final EIS (and developing its policy) consider the additional data alluded to in the Metro draft search. A policy as far reaching as the one about to be developed on aquatic plant control must take into consideration the latest research on chronic human health effects. Without these data, the final EIS would be deficient.

HEALTH EFFECTS OF HERBICIDES

The DEIS gives a totally inadequate treatment of the human health effects of the herbicides proposed for use. It provides virtually no information on both acute and chronic toxicity of the chemicals.

The only piece of relevant data is the human LD50 for 2,4-D (page A-3). No comparable data is given for endothall, casoron or diquat. All of the remaining tables are irrelevant with regards to humans, since one cannot extrapolate LD50 data from other species to humans. In addition, it is crucial to remember that an LD50 is only a statistical average. There is wide variation in individual susceptibility to a toxic substance, thus there is no indication as to the danger to any one person.

The DEIS lacks information on sublethal toxicity, which is often seen at doses significantly below those that cause death. Humans exposed to 2,4-D have experienced headaches, dizziness, nausea, vomiting and muscular weakness (Casarett, L.D. and Doull, J.D. 1975. Toxicology 437-438). Also several cases of peripheral neuropathy have been reported (Goldstein, N.P. et al. 1959. Peripheral Neuropathy After Exposure to an Ester of Dichlorophenoxyacetic Acid. J. Amer. Med. Assoc. 171, 1306-1309; and Berkley, M.C. and Magee, K.R. 1963. Neuropathy Following Exposure to a Dimethylamine Salt of 2,4-D. Arch of Int. Med. 111, 351-352). We believe that the public should be warned of these symptoms since there is chance of exposure following any spraying.

Chronic effects of these herbicide compounds are only briefly mentioned (pages 58-59 and A-2). In both cases it is admitted that little is known about the long term effects of 2,4-D and that the subject is still highly controversial. Bearing this in mind, it is dangerous to assume that 2,4-D is safe simply because the information is not available. It would be far wiser to assume that it is hazardous until definitive tests have proven it otherwise.

On page 59 it is stated that "there has never been any indication that 2,4-D in concentrations used for aquatic plant control, would cause public health problems". It is an accepted policy by scientists that one cannot establish a "no effect" level for carcinogenicity and teratogenicity. If a chemical exhibits these effects at high doses, some individuals may be susceptible even at lower doses. The above quote ignores these facts. Also, the quote overlooks two points. One, particularly pertinent to teratogenesis (birth defects), is the vast amounts of toxic substances in our man-made environment and their potential for cumulative effects. This makes it difficult to sort out which substances are causal and to understand the unknown/untested synergistic effects. In addition, it behooves us to reduce the use of toxic substances where an alternative exists. Secondly, after a 10-20 year latency period, it is difficult to PROVE conclusively that a chemical caused a cancer. Yet in light of the scientific herbicide controversy, recent studies and anecdotal evidence, to perpetuate the half truth that positive human proof is lacking is, at best, uninformed.

Contrary to the information in the DEIS, there are several studies which suggest that 2,4-D may be carcinogenic (cancer causing), mutagenic (mutation causing) and teratogenic (birth defect causing). The Corps is referred to the previously mentioned Metro literature search conducted by Dr. Ruth Shearer for this information and for the appropriate references.

The most recent study (Reuber, Melvin D. 1979. Carcinogenicity of 2,4-dichlorophenoxyacetic acid. Manuscript) suggests that 2,4-D is carcinogenic in rats (mammary gland and lymphoreticular system) and in mice (lymphoreticular system) and that this data is relevant to humans. 2,4-D has also shown positive results in several mutagenicity tests:

- Magnuson, J. et al. 1977. Mutagenic effects of chlorinated phenoxyacetic acids in Drosophila melanogaster. Hereditas 87, 121-123.
- Ahmed, F. E. et al. 1977a. Pesticide induced DNA damage and its repair in cultured human cells. Mutation Research, 42, 161-174.
- Hart, R. W. et al. 1977. In Vitro Assessment and Mechanism of Action of Environmental Pollutants. Annals of New York Ac. of Sciences, 298, 141-158.
- Ahmed, F. E. et al. 1977b. Pesticide Induced Ouabain Resistant Mutants in Chinese Hamster V79 Cells. Chem. Biol. Interactions 19, 369-374.

Studies have suggested that 2,4-D is teratogenic and fetotoxic in rats, mice, pigs and hamsters. In light of the number of different mammalian species in which teratogenesis has been detected, there is cause for great concern that it is also teratogenic in humans:

RAT
- Khera, K.S. and McKinley, W.P. 1972. Pre- and Postnatal Studies on 2,4,5-Trichlorophenoxyacetic Acid, 2,4-Dichlorophenoxyacetic Acid and Their Derivatives in Rats. Toxicology and Applied Pharmacology 22, 14-28.
- Schweta, B. A., Sparschu, G. L. and Gehring, P. J. 1971. The Effects of 2,4-Dichlorophenoxyacetic Acid (2,4-D) and Esters of 2,4-D on Rat Embryonal, Foetal and Neonatal Growth and Development. Fd. Cosmet. Toxicol. 9, 801-817.
-Aleksashina, Z.A. et al. 1973. Embryotoxic Action of the Diethylamine Salt of 2,4-D. Gigiena I Sanitariy 2, 100-101.

MICE
- Courtney, K. Diane. 1977. Prenatal Effects of Herbicides: Evaluation by the Prenatal Development Index, Arch. Environm. Contam. Toxicol. 6, 33-46.

PIG
- Bjorklund, Nils-Erik and Erne, Kurt. 1966. Toxicological Studies of Phenoxyacetic Herbicides in Animals. Acta vet. scand. 7, 364-390.

HAMSTER
- Collins, T.F.X. and Williams, C.H. 1971. Teratogenic Studies with 2,4,5-T and 2,4-D in the Hamster. Environmental Contamination & Toxicology 6, 559-567.

The DEIS makes no mention of one breakdown product of 2,4-D, 2,4-Dichlorophenol (2,4-Dph) which has also been implicated as a carcinogen (Boutwell, R.K., and Bosch, D. K. 1959. The Tumor-promoting Action of Phenol and Related Compounds for Mouse Skin. Cancer Research, 19, 413-424). After the lesson on the toxicity of TCDD found in 2,4,5-T formulations, it would seem wise to pay attention to 2,4-Dph.

One study suggests that 2,4-D and 2,4-Dph could act synergistically at very low levels to cause teratogenesis (Konstantinova, T.K. et al. 1976. The Embryotropic Effect of the Dissociation Products of Herbicides Based on 2,4-D. Gigiena I Sanitariya 11, 102-1050.

The DEIS contains no information on chronic toxicity of the other chemicals proposed for use. There is little data available on them, with the exception of evidence that Diquat produces severe human eye injury (Toxicology....439; Cant J.S. and Lewis, D.R.H. 1968a. Ocular damage due to paraquat and diquat. British Med. Journal 3, 59; Cant and Lewis, 1968b. Ocular damage due to paraquat and diquat. British Med. Journal 2, 224).

One can easily see that none of these herbicides has been proven safe with regards to chronic toxicity. We are particularly opposed to 2,4-D since data are accumulating that implicate it as a carcinogen and a teratogen. Since other effective methods for controlling aquatic plants are available, we suggest that herbicides need not be used.

WILDLIFE

Impacts of proposed chemical application on wildlife must be spelled out in much greater detail in the final EIS. We request especially an amplification of the section on negative impacts to marshlands. Marshlands need to be better identified and specific protective measures need to be defined. The Lake Washington and Lake Sammamish wetlands become increasingly valuable for the resting and feeding of migratory waterfowl as such habitat becomes locally more scarce.

We are concerned about the drift of herbicides from the point of application into adjacent waters, especially into marsh areas, and about the retention of herbicides in the sediment. Recent research indicates the sediment as the primary deposition site of 2,4-D (McKenzie et al, 1975. Final report of the Commissioners. Royal (Canadian) Commission of Inquiry into the Use of Pesticides and Herbicides). Invertebrates in the sediment absorb the chemicals which are thereby introduced into the food chain.

The DEIS presents no data on how herbicides distribute in the water column. Nor is any data given on proposed concentration of herbicides nor of safe use. When the Tennessee Valley Authority increased herbicide applications for milfoil control, the milfoil increased (TVA publication, "Perspective", Summer, 1976). What is the explanation for this? It appears to refute the common misconception that herbicides eradicate (kill) milfoil in a single application.

Has 2,4-D, in fact, proven effective against milfoil? We found no citation to substantiate either this assertion or that 2,4-D is selective against milfoil. Could it be that 2,4-D kills native aquatic vegetation, thereby creating a void which milfoil explodes to fill?

The final EIS must develop the question of natural cycles of aquatic plants. In some parts of the U.S., Canada and locally, Eurasian watermilfoil appears to be in a natural decline (Metro literature; DEIS page 6, paragraph 1). We request that this matter be researched and included in the final EIS.

The Department of Game has expressed concern about the use of herbicides, especially 2,4-D on wetlands and spawning and rearing sites for salmonids and spiney rayed fishes, an area which would include most or all of the proposed use locations.

The State Department of Fisheries states that it "cannot support the use of 2,4-D to treat milfoil when salmon are present in the treated areas until we have seen data on the effects of the specific chemical proposed for use on different types of salmon, i.e., both fry and fingerlings" (DEIS page B15, paragraph 2). If the most effective application time for herbicides coincides with the spawning season; then the herbicide application time would have to be delayed; thereby reducing effectiveness of the chemical. This is an important added reason to opt for a non-chemical solution to milfoil control.

COE GOALS AND PURPOSES

Would you please clarify the goals and purposes of this proposed program. At the public hearing it was referred to as a "test program". Please define that term. Also, please explain the 3 year time frame, and how during that time, and beyond it, the COE sees its role pertaining to program/policy decisions, administration and funding.

Also, we would like for you to identify the term "management" as used in "aquatic plant management program". For this DEIS, does "management" refer only to milfoil?

Is there a contradiction of goals on eradication of milfoil? On page 29 (1.06), the Prevention Program states, "Total eradication of milfoil colonies would be attempted in those areas which directly threaten uninfested navigable waters". However, on page 15 paragraph 4, eradication attempts have not been successful elsewhere and would not be attempted in Washington State.

COST-BENEFIT ANALYSIS

Because there is no explanation of how the benefit/cost analyses were determined, we cannot accept them. We were promised a copy of the Design Memorandum; however, at this writing it has not been received. We strongly request that the final EIS, itself, contain detailed figures and explanations of computations including actual researched costs of all proposed control methods.

EPA REGISTRATION

We would like to emphasize that simply because chemicals are registered with the Environmental Protection Agency does not mean they are guaranteed of safety. U.S. Senate hearings in 1976 bore out that the EPA has failed in its responsibility to the public regarding valid registration of toxic chemicals. 2,4-D was one of the "glaring examples" named in the hearing. EPA itself cites insufficient manpower, inadequately trained staff, and the lack of sound data as crippling problems. The continued argument that EPA registration denotes safety must be eliminated from future discussions of herbicide applications in the waters of this state.

- Summary of the EPA and the Regulation of Pesticides, Staff Report to the Subcommittee on Administrative Practice and Procedure of the Comm. on the Judiciary of the U.S. Senate. December, 1976.
- "Toxic Substances: EPA and OSHA are Reluctant Regulators". Science, Vol. 203, January 5, 1979.
- "EPA's Pestilential Oversight". Time, page 64, January 17, 1977.
- "Upstairs, Downstairs at EPA". Audubon, March, 1977 pages 148-149.

ADDITIONAL COMMENTS

There is raised in the DEIS the threat that herbicides might be used clandestinely if not approved. The possibility always exists that someone will do something illegal or dangerous because they have not had immediate satisfaction. We cannot accept that as justification for taking such an action. We suggest that the Corps point out jointly with this threat, the risk that such action involves as well as the reminder that there ARE alternatives to herbicides.

To have milfoil in the water is a nuisance, but not a direct threat to life or livelihood. To justify control, especially chemical control with its inherent risks, on the basis of economics does not follow (refer to benefit/cost Analysis 1.05.4).

The boaters and homeowners enjoying the use of our public waters must have a balanced consideration for the rights of the larger community, specifically the right to enjoyment of waters free of toxic chemicals. Also, the entire community has a right to open and complete presentation of all data pertaining to aquatic plant control in those waters. We appeal to the Corps to provide just such a complete presentation.

Seattle Audubon Society would like to be a part of the larger community working toward non-chemical management of aquatic plants in the State of Washington. As we stated above, we would be happy to supply data on request. Also we would welcome the opportunity to discuss the project with you. Thank you.

Sincerely,

Wilma Anderson

Wilma Anderson, Chairperson,
ad hoc Committee on Pesticides
SEATTLE AUDUBON SOCIETY

home address: 11018 Exeter Avenue NE
Seattle, WA 98125
363 4948

SIERRA CLUB .. Cascade **Chapter**

FOUNDED IN 1892

4534½ University Way, NE
Seattle, Washington 98105

(206) 632-6157

September 5, 1979

Robert Rawson
Department of the Army
Seattle District, Corps of Engineers
P.O. Box C-3755
Seattle, Washington 98124

Dear Mr. Rawson,

The following are the comments of the Sierra Club on the draft environmental impact statement (DEIS) "Aquatic Plant Management Program - State of Washington".

First, we believe that this DEIS does not adequately evaluate the tradeoffs involved as to whether the plant in question, milfoil,should be "managed" at all. There is very little detail provided on just how bad the milfoil "problem" is, and on the other side of the question, how importent are the benefits of milfoil growth. Some boaters may feel milfoil interferes with their recreation, but increasing numbers of bass fisherman find milfoil to be a great benefit to their sport. Milfoil provides importent habitat for waterfowl, fish, and microinvertebrates, which contributes to the health of the entire aquatic ecosystem. Before milfoil is removed from that ecosystem, those benefits, and the consequences of removing them, must be more fully evaluated.

Secondly, we are not convinced that the number and extent of the areas where milfoil is growing in Washington state is increasing at all. Some areas in the United States and Canada where milfoil growth has increased have seen that growth peak, and then decline. Seattle METRO's surveys of aquatic plants in the King County area show evidence that milfoil growth has stabilized. We therefore do not understand the urgency with which the Army Corps seems to be pursuing milfoil control.

In addition, the DEIS does little or nothing to delineate the causes of milfoil growth in northwest waters. Without this information, any control (treatment) program is likely to be cosmetic in nature, necessitating perennial retreatments because the factors favoring milfoil growth have not been changed.

The discussion of 2,4-D as a control method is completly lacking in information with which to evaluate its costs and benefits. The DEIS fails to adequately outline 2,4-D's predicted efficacy over the long term. Since the proposed treat-

" not blind opposition to progress, but opposition to blind progress"

ment areas are limited, why wouldn't recolonization from adjacent areas result in rapid regrowth? If so, how often would the areas require retreatment? Largely absent from the DEIS are references to studies on the toxicity and carcinogenicity of 2,4-D to waterfowl, fish, and other aquatic organisms. Nor does the DEIS deal adequately with the hazards of drift of 2,4-D, and other herbicides, in the aquatic environment. How are wetlands, and other ecologically sensitive areas in or adjacent to the treatment areas to be protected from toxic effects? We are concerned that the use of 2,4-D and other herbicides as proposed in the DEIS may present an unnecessary and unacceptable risk to the health of local aquatic ecosystems, and thus we feel that it should not be utilized.

The benefits of harvesting milfoil with an aquatic mower are not considered in great enough depth in the DEIS. Some research suggests that harvesting poses much less risk to fish and wildlife in and around the treatment area. Habitat disturbance is minimized, since the plant cover along the bottom remains in place, and there is no threat of toxic impacts on adjacent areas as there is with herbicides. And, by removing the nutrients in the plant material harvested, the need for perennial retreatments may be reduced, along with the costs.

There is little information presented in the DEIS with which to make decisions on other treatment alternatives, such as bottom-covering with Aquascreen. Biological treatment is dismissed shortly as either infeasible or a subject for future research. We feel these options must be explored more fully before final treatment decisions are made.

Because of the varying individual character of the aquatic ecosystems in the proposed treatment areas, the need for site-specific analysis is paramount to any consideration of milfoil "management". Some areas may contain spawning grounds for bass, or rearing grounds for migrating salmon; some may be importent habitat areas for waterfowl; still others may have water currents that make chemical treatments extremely hazardous due to possible drift effects. Little distinction is made in the DEIS between lake habitat and river habitat. The DEIS is totally deficient in site-specific analysis of this kind.

The cost/benefit analysis hardly deserves the name, it is so lacking in substance. We are told that more data is contained in the Design Memorandum, but this document was not available to the public for review during this comment period. How are citizens and elected officials to make competent choices when the information they need on which to base those choices is not available? The handling of a review

process in this fashion seems to us to be not in keeping with either the letter or intent of the Clean Water Act, and its public participation requirements.

The DEIS expresses concern that if milfoil is not controlled now, it will "infest" ever greater areas of freshwater in Washington state. As stated above, we question whether milfoil growth is expanding. Moreover, we do not understand how treating very limited areas along private docks and marinas, leaving the vast majority of the milfoil acreage untreated is going to stop the growth you project? If these treatments are not intended to stop that growth, what is the purpose of this "management program"?

Finally, we do not see how the Army Corps can justify the rapidity with which this process has been moving forward, and indeed the writing of this DEIS at all now, when Seattle METRO has not yet completed their two-year research project on milfoil biology and control. The knowledge METRO is producing will likely be invaluable to any statewide look at the milfoil question. It seems to us at least premature, and perhaps rash for the Army Corps to be proposing milfoil control before METRO's study is completed. We must reiterate that we need to know the cause of milfoil growth in the Northwest before we try to limit that growth; and METRO's study may provide some useful insights into that question.

We thank you for the opportunity to review this DEIS, and await your response to these comments.

Sincerely,

Tom Eckman

Tom Eckman, Chairman
Cascade Chapter
Sierra Club

cc: Bob Burd, U.S. Environmental Protection Agency
John Lampe, Seattle METRO

STATE OF
WASHINGTON
Dixy Lee Ray
Governor

DEPARTMENT OF GAME
600 North Capitol Way, GJ-11 Olympia, WA 98504 206/753-5700

September 11, 1979

Lt. Col. Maxey B. Carpenter, Jr.
U. S. Army Corps of Engineers
Seattle District
P. O. Box C-3755
Seattle, Washington 98124

DRAFT ENVIRONMENTAL IMPACT STATEMENT:

Aquatic Plant Management Program

Colonel Carpenter:

We find that Department of Ecology did not accurately summarize our comments on your document. In our response dated August 23, 1979, we stated:

> "We have concerns over the use of chemicals to control milfoil. Because they are non-selective, we recommend that endothall, casoron, diquat, simazine, silvex, and fenac not be used. While 2,4-D appears to be least damaging herbicide, we are not confident that it would not impact fish fry nor possibly present long-term impacts to fish or wildlife production. In general, we would recommend against its use in wetlands and spawning and rearing sites for salmonids and spiny-rayed fishes. For control of milfoil adjacent to sensitive areas we would recommend only hand removal."

This is substantially different from the summary of our statements provided by Department of Ecology.

It has been the usual policy for Department of Ecology to send copies of our letters to the responsible federal agency. This approach, we feel, helps avoid confusion in communication between agencies.

We hope this letter clarifies our comments and allows your agency to produce an accurate document.

Sincerely,

THE DEPARTMENT OF GAME

Bob Zeigler

Bob Zeigler, Applied Ecologist
Environmental Affairs
Habitat Management Division

BZ:mjf

cc: Regional Manager
Agencies

Enclosure

STATE OF
WASHINGTON

DEPARTMENT OF GAME
600 North Capitol Way, GJ-11 Olympia, WA 98504 206/753-5700

August 23, 1979

Maxey B. Carpenter, Jr.
Lt. Colonel, Corps of Engineers
Acting District Engineer
Seattle District, Corps of Engineers
P.O. Box C-3755
Seattle, Washington 98124

DRAFT ENVIRONMENTAL IMPACT STATEMENT:

Aquatic Plant Management Program - State of Washington (Lake Washington, King County, and Lake Osoyoos and Okanogan River in Okanogan County)

Colonel Carpenter:

Your document was reviewed by our staff as requested; our comments follow.

We concur that Eurasian watermilfoil can create problems. However, we recommend that control be directed to areas of heavy boating and swimming use. In your discussion of marsh areas (page 41) you state, "Care must be taken in the selection of control methods to insure that the fish and wildlife values of sensitive sites are protected". Unless the milfoil is detrimental to fish resources in these areas, would it be necessary to attempt to control it in these sensitive sites?

We have concerns over the use of chemicals to control milfoil. Because they are non-selective, we recommend that endothall, casoron, diquat, simazine, silvex, and fenac not be used. While 2,4-D appears to be least damaging herbicide, we are not confident that it would not impact fish fry nor possibly present long-term impacts to fish or wildlife production. In general, we would recommend against its use in wetlands and spawning and rearing sites for salmonids and spiny-rayed fishes. For control of milfoil adjacent to sensitive areas we would recommend only hand removal. We have included information we have on spiny-ray habitat in Lake Washington.

We are also concerned with the impact of large amount of dissolved oxygen being "taken out of the water by the biological decomposition of dead milfoil". This can be critical since the preferred time for chemical treatment is summer, a time when dissolved oxygen is reduced as a result of elevated water temperature.

We concur with your statement on page 67: "Biological control may be the most economical and the least disruptive method to deal with milfoil. However, we are concerned with the long-term impacts of the importation of exotic species. It is illegal to import or have possession of the white amur in Washington State (WAC 232-12-670 of RCW 77.04). For biologic control, we would recommend using native species of insects or planting native aquatic vegetation such as water lilies or other macrophytes that may resist milfoil infestation. Additional research should be performed to identify the best biologic control to use (page 62).

Have marinas, bulkheads, and breakwaters encouraged the growth of milfoil by restricting flushing? Could hydraulic improvements to allow greater flushing help control growth in these heavily used areas?

Is there any possibility that milfoil control could actually encourage infestation by maintaining conditions that allow for explosive growth and eliminating natural limiting factors? If all vegetation is removed from an area would this allow recolonization of the milfoil?

On page 11 you state, "One of the main problems with harvesting milfoil is upland disposal. Transport and handling are expensive and many attempts have been made to find a use for the harvested milfoil to partially defray the cost." Would it be possible to allow gardeners to pick up composted milfoil? Milfoil could serve as a source of potassium. It may not be necessary to transport but it could be given to gardeners who would haul it away.

Is there any correlation between milfoil and encephalitis outbreaks? It seems unlikely that milfoil would increase mosquito-borne diseases (page 58).

Additional comments follow on Lake Washington and the Okanogan River system.

Lake Washington is important for wildlife production especially in the ten remaining wetland areas. Lake Washington also provides waterfowl feeding and resting area during fall migration (page 41).

Okanogan River and Lake Osoyoos are both important for fish and wildlife production as well as a source of irrigation water (page 44). Does this system hold potential for serious milfoil infestation? It would seem that hydraulic factors

involved in the river and reservoir would prevent massive milfoil growth. Stream flow, fluctuating water levels and low reservoir productivity should limit milfoil. Would you explain what type of barrier would be constructed in Okanogan River to prevent the spread of milfoil (page 30)? Would it interfere with fish migration?

While different control methods would be appropriate in different cases, extreme care should be taken to insure that impacts to fish and wildlife are minimal. Milfoil control measures would require Hydraulics Project Approval from the Departments of Fisheries and Game.

Thank you for sending your document. We hope you find our comments helpful.

Sincerely,

THE DEPARTMENT OF GAME

Bob Zeigler

Bob Zeigler, Applied Ecologist
Environmental Affairs
Habitat Management Division

BZ:mjf

cc: Regional Manager
Agencies

Attachment

WASHINGTON ENVIRONMENTAL COUNCIL
107 South Main Street / Seattle, Washington 98104 / (206) 623-1483

13 Sept 1979

From: Washington Environmental Council
To: U.S. Army Corps of Engineers, Seattle District

Re: Comments on Draft EIS on Aquatic Plant Management Program

Dear Sirs:

This letter is written in response to the Corps of Engineers' draft impact statement "Aquatic Plant Management Program." We wish our comments to be included in the final EIS.

The Washington Environmental Council recognizes that the aquatic plant, Eurasian Milfoil, has become a nuisance to water sports in Washington state in recent years. However, we have never seen any firm indication that it represents a safety hazard to responsible swimmers and boaters. In light of this, we are increasingly concerned over the potential application of toxic chemicals in our lakes and waterways for the removal of an aquatic plant which, by the Corps' own admission, has benefits to wildlife (page 7) and lake nutrient level reduction (page 50). This is particularly true when the Corps' entire economic justification for the project is recreational (page 28).

The EIS's information on toxicity of the proposed chemicals, particularly 2,4-D, is inadequate. While the exact impact of 2,4-D on humans and wildlife is still debated, there is a growing body of evidence which suggests it is both carcinogenic and teratogenic. We direct your attention specifically to a 1979 study done by Alvin Reuber at the National Cancer Institute. The EIS itself states (page A-2) that long-term impacts of low concentrations of 2,4-D are not known. The implication on page 59 that these chemicals are safe in the amounts used for aquatic plant control should be removed from the final impact statement. Both the National Academy of Sciences and the Surgeon General have stated that there is no threshold level for toxic chemicals. Any amount should be considered dangerous. Chemicals should <u>not</u> be considered innocent until proven guilty. Given the uncertainities surrounding the safety of the proposed chemicals the Corps should show extreme hesitation in sanc-

tioning their release into public waters when alternate methods are possible.

The Corps' EIS projects the 'potential' spread of milfoil in Washington state (page 11) and suggests in the public brochure that this spread would impact not only recreation but irrigation and electric generation. The WEC would like to caution the Corps to emphasize in the final EIS that both the spread of the plant and its adverse impacts are only possibilities. They have not yet and may never occur. No mention is made in the EIS of the natural growth and decline cycles of milfoil. While Chesapeake Bay is mentioned (page 2) as an area of serious milfoil manifestation in the 1960's, no mention is made of the fact that the Bay is presently experiencing a natural die-back of the plant. This natural reduction in growth is also occuring in the Wisconsin Lake region and does not appear to be attributable to the mechanical controls used in that area. The causes of these declines are little known; but the pattern of explosive growth followed by declining abundance seems typical. Consideration and study of these natural growth cycles should be made before commitment to a potentially environmentally damaging control program is undertaken.

Where control is deemed necessary, the WEC supports the Corps' proposed use of mechanical controls. The techniques have been used with great success in the lakes and waterways of Ontario, British Columbia, Wisconsin, New York, and California. Mechanical harvesters can be used without significantly impacting fish and wildlife populations and may actually be useful in creating conditions beneficial to wildlife. According to the EIS, the mechanical harvest control methods' negative environmental/sociological impacts.

In light of the obvious benefits of harvesting, the WEC is concerned that the emphasis of the draft EIS appears to be on chemical control. Information on harvesting is scattered throughout the document with no mention in an appendix of the facts and figures on performance that are available from the existing harvesting programs in this country and Canada. The bibliography suggests that much less attention was given to chemical controls.

The Corps' emphasis on the problems of harvested milfoil disposal is unjustified. Given the preponderence of home and truck gardening in the Seattle area and the cooperation of local environmental and agricultural organizations in coordinating disposal/composting efforts, this so-called 'problem' could actually become a side benefit.

The View Ridge Community PeaPatch is already involved in composting the milfoil harvested by METRO earlier this year. The coordinators of the project, Emily Mandelbaum and Jim and Viki Bruvold, are enthusiastic about expanding their facilities to a larger scale.

No information is given comparing costs of mechanical and chemical control. Are we to assume, therefore, that the costs are similar? The EIS states on page 60 that "many property owners .... feel that chemical control is the most effective and and the least expensive available." Is this feeling justified? The Corps' EIS indicates harvesting is as

effective as chemical control. It might well be more effective when the necessity of refraining from chemical control during optimum spray times because of salmon spawning season is considered. Estimates from other parts of the country on harvesting run from $62 to $600 per acre. Even the wide variation in costs according to individual lake conditions, mechanical harvesting still appears cost competitive when compared to the $300 per acre rough estimate for chemical control given at the Department of Ecology's public hearings in April of 1979. As was mentioned by James Carsner of Aquatic Control, mechanical harvesting will become increasingly attractive as the costs of petrochemically derived herbicides continue to spiral upward. Harvesting costs muct be clearly defined and compared to equally clearly defined costs of chemical control in the final EIS.

Another alternate technique which is given inadequate attention in the Corps' EIS is bottom screening. It is deemed an improbable control because of its high per acre cost. However, this technique can be very effective in small areas around moorages and swimming beaches where complete control is desirable. James Carsner pointed out at the public hearings that the high cost figure in the draft and public brochure is deceptive. Screening would be done in areas much smaller than an acre. He estimated the cost for a private home owner would be $700 to $800 (and screens can be used year after year). With the rental programs which are available that cost could be reduced further. High initial costs would be offset by long service life.

We were surpised that both the Corps in its DEIS and its local sponsor the DOE should mention possible illegal use of chemicals by private property owners as a rationale for instigating a chemical control program. Personal abuse of the law is the worst possible justification for governmental sanction of any program or method of treatment. Vigilante dumping of chemicals is not a question of civil disobedience. It is simply breaking the law. In the future, both the Corps and the DOE should take the strongest possible stance against this practice.

One of the items of concern to the Corps is the impact of the program on community cohesion (page 60). We object to the implication that <u>any</u> aquatic plant control program "is sure to cause increased friction" between environmentalists and property owners. Must we infer from this statement that no environmentally sound control program is possible? It is clear even from the preliminary report of the Corps that an environmentally sound/economically feasible program <u>is</u> possible. A mechanical harvest program coupled with screening in shallow beach and dock areas would provide an effective solution not only to the aesthetic/recreational needs of the lakeside property owners but to aesthetic/environmental needs of conservationists and the community at large. This option must be given adequate attention in the final EIS.

We appreciate this opportunity to comment on the draft impact statement.

Sincerely,

Kathleen Beamer

Kathleen Beamer
Executive Director

September 13, 1979

Grant County Chapter, W.E.C.
1165 Yakima Street
Ephrata, WA 98823

WASHINGTON ENVIRONMENTAL COUNCIL

107 South Main Street / Seattle, Washington 98104 / (206) 623-1483

Army Corps of Engineers, Seattle District
P.O. Box C-3755
Seattle, WA 98124

Sirs/Madams:

The Grant County Chapter of the Washington Environmental Council respectfully submits the following comments concerning the draft Environmental Impact Statement for the Aquatic Plant Management Program for the State of Washington.

First, a non-chemical approach to the problem of milfoil infestation would be preferred. The herbicide 2,4-D seems to have adverse health effects, the full range of which are not yet delineated. The level of 2,4-D application proposed by the Corps is too great relative to our knowledge of the effects of this chemical on humans and wildlife.

While mechanical harvesting of the milfoil also has problems, we do believe the Corps should thoroughly analyze the different types of devices and methods available to harvest milfoil. For example, mention should be made of the Maggs milfoil-cutting machine being developed in Richmond, British Columbia, and already successfully tested in Lake Okanogan in July of this year. This plow cleared 600 square yards of dense milfoil, including root nodules, in a one-hour test run. According to Mel Maxnuk of the British Columbia Water Investigation Branch in Vernon, inspection near the end of August showed the area plowed by the machine had remained clear of growth. Reference: Wenatchee World, Aug. 27, 1979.

We would also like a more detailed cost-benefit analysis presented in the final EIS. We would particularly want to point out that a cost not identified in your analysis would include the money spent to prevent chemical applications in Lake Washington. If the cost to a private landowner for spraying is an identified benefit of the program, then it should follow that the costs incurred by public non-profit community organizations to prevent herbicide application would have to be identified as a cost of your program.

Lastly, the Grant County Chapter of the W.E.C. would like to know where Grant County waters, including Billy Clapp Lake, Banks Lake, and the Evergreen Reservoir, stand in your program, in recognition of their inclusion in the draft EIS as infested areas.

Sincerely,

Jeffrey F. Gilman, Chair, Grant County W.E.C.

DEDICATED TO THE PROMOTION OF CITIZEN, LEGISLATIVE AND ADMINISTRATIVE ACTION TOWARD PROVIDING A BETTER ENVIRONMENT

Mr. & Mrs. William R. Favro
829 E. Lake Sammamish Shorelane S. E.
Issaquah, Washington 98027

September 14, 1979

Department of the Army
Seattle District Corps of Engineers
P. O. Box C-3755
Seattle, Washington 98124

Attn: Robert Rawson

Gentlemen:

I have just received the Draft Environmental Impact Statement entitled "Aquatic Plant Management Program - State of Washington" which you have mailed to me.

I would like to put on notice that my Wife and I and also my neighbors get water out of Lake Sammamish for domestic water supply and we are very concerned about the possibility of the use of herbicides in Lake Sammamish and their affect on our water supply and our health.

We therefore are very strongly opposed to the use of any herbicides in Lake Sammamish.

Very truly yours,

William R. Favro

William R. Favro

FRIENDS OF THE EARTH

September 14, 1979

Col. Leon K. Moraski
District Engineer, Seattle District
U.S. Army Corps of Engineers
P.O. Box C-3755
Seattle, WA 98124

Dear Col. Moraski:

The following constitutes the comments of Friends of the Earth on the draft environmental impact statement (EIS) for the Corps of Engineers proposed Aquatic Plant Management Program for Washington state.

The environmental impact statement is intended to help public officials make decisions that are based on a understanding of environmental consequences but this EIS cannot fulfill this purpose because it fails to adequately describe the environment of the areas to be affected by the proposed program.

The Columbia River environment is not even discussed in the draft EIS yet five reaches of the Columbia are part of the Eurasian watermilfoil prevention program and according to the Aquatic Plant Management Program Public Brochure, August 1979 (but not the draft EIS) eradication of Eurasian watermilfoil colonies in the Columbia River Reservoirs will be attempted using applications of 2,4-D, the suction dredge, rotovation, or hand pulling. 40 CFR 1502.15 states that the EIS shall succinctly describe the environment of the areas to be affected by the alternatives under consideration. The Corps of Engineers has not done this with respect to the Columbia River and, in fact, only one sentence appears in the draft EIS which indicates that five reaches of the Columbia are indeed part of the prevention program (Page 30, Sec. 1.06.4). Considering the importance of the Columbia River to the Pacific Northwest the environment of the Columbia should be examined and the impact of the proposed prevention program as it affects the Columbia should be discussed.

In addition to the omission of a discussion of the Columbia River, Sec. 2 suffers from a lack of site specific information. This is critical because the actual treatment methods to be used at each specific site (and the subsequent environmental impact) have not yet been determined and according to the draft EIS onsite environmental conditions will be a factor in determining which treatment methods are to be used. The information presented in Sec. 2 is of such a general nature that the decision on which treatment method to use at a specific site cannot be made based on an understanding of the environmental consequences. In order to make an informed decision about which treatment method to use at a specific site it is necessary to know if the area is an ecologically important marsh, if the area is subject to herbicide drift, if the site is an important salmon area, if the area has any irrigation water intakes, if the site is an important wildlife area, if the area is subject to periods of low dissolved oxygen concentrations, etc. The draft EIS should have, but failed to identify the critical onsite environmental conditions, the

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knowledge of which is necessary for proper decisionmaking.

Several important statements are made in the draft EIS for which no basis of support is given. 40 CFR 1502.24 states that agencies shall make explicit reference to the scientific and other sources relied upon for conclusions in the EIS. On page 56, Sec. 4.06.5.1 the Corps of Engineers concludes that no fish kills, due to the toxicity of 2,4-D, would be expected at the concentrations used to control Eurasian watermilfoil. The data listed in Appendix A of the draft EIS representing the acute toxicity of 2,4-D to fish does not include important species which are indigenous to Washington and therefore cannot be used to support the conclusion. It is generally recognized that the toxicity of 2,4-D to salmonids has not been adequately tested and the data presented in Appendiz A confirms this. Claims made that fish avoid areas treated with 2,4-D and that the impact to aquatic organisms would be minimized by timing the herbicide applications are unsubstantiated and we question the effectiveness of herbicide application timing because of the overlap of salmon migrations, the persistence of 2,4-D and the susceptibility of 2,4-D to drift. It should be noted that the Aqua-Kleen label states that fish and other aquatic organisms may be killed at application rates recommended on the label. Aqua-Kleen is a granular herbicide product containing 2,4-D BEE.

The Corps of Engineers states on page A-2 of the draft EIS that many scientific studies of the chronic health effects of 2,4-D have been done but the results have thus far been inconclusive. According to Dr. Ruth Shearer, who has conducted a comprehensive search of the world-wide literature relating to the effects on the public health of using 2,4-D, endothall, diquat and dichlobenil, only three laboratory studies of the carcinogenicity of 2,4-D or its derivatives appear in the scientific literature and none of these tests meet modern environmental toxicology standards. On page 59, Sec. 4.08.2 the Corps of Engineers concludes that there has never been any indication that 2,4-D, in concentrations used for aquatic plant control, would cause public health problems. Both the Seattle Water Department and King County have recently examined the public health aspects of 2,4-D use and each arrived at quite different conclusions. They determined that:

1. With existing information there is still a reasonable doubt as to some possible long range health ramifications;
2. The effects of long term human exposure have not been conclusively established;
3. The alleged risks of using 2,4-D are sufficiently serious to preclude its use.

The Seattle Water Department and King County have established moratoriums on the use of 2,4-D in areas under their jurisdiction. Both of these agencies examined the toxicological data and determined that 2,4-D has not been proven safe and therefore should not be used. The Corps of Engineers examined the toxicological data and determined that 2,4-D has not been proven hazardous and therefore should be considered for use. We are very disturbed by the Corps of Engineers' attitude toward potential health hazards and feel that the decision

to use herbicides was not made in the public's best interest. If there was a clear and overwhelming benefit associated with herbicide use then the Corps' position might be justified. However, the use of herbicides to control Eurasian watermilfoil will result merely in "chemical mowing" at a cost not significantly below that of mechanical harvesting. 2,4-D is currently on the EPA's pre-RPAR (Rebuttable Presumption Against Registration) list and if placed in RPAR status 2,4-D will, for the first time, receive a thorough review. Until this occurs we feel that 2,4-D should not be used if acceptable alternatives exist. We urge the Corps of Engineers to reconsider its support for the herbicides 2,4-D, endothall, diquat and dichlobenil.

No information is presented in the draft EIS which would explain how the costs and benefits of the Aquatic Plant Management Program were determined (pages 28-29, Sec. 1.05.4 and page 30, Sec. 1.06.4). Instead we are referred to the State Design Memorandum which has not yet been released to the public. 40 CFR 1502.21 states that no material may be incorporated by reference into the EIS unless it is reasonably available for inspection by potentially interested persons within the time required for comment. The Benefit/Cost analysis for the Aquatic Plant Management Program deserves public review and comment but this was not possible because of the lack of information presented in the draft EIS. A detailed discussion of the methodology and derivation of the benefits and costs should have been included as an appendix to the draft EIS. Since this was not done we request that a formal public comment period be established for the Design Memorandum.

The relationship between the local sponsors, the Department of Ecology (DOE) and the Corps of Engineers is not clear to us particularly since we have learned that there are as of yet no local sponsors for the 1980 program. The Corps of Engineers has stated on several occasions that local sponsors would submit treatment proposals to DOE for inclusion into a state program and this program would then be submitted to the Corps of Engineers for approval (page 15, Sec. 1.05). Since the Corps has a 1980 proposal it is apparent that part of the program has been conducted in a manner contrary to that described by the Corps of Engineers. What are the responsibilities and obligations of the local sponsors, DOE, and the Corps of Engineers? Who assumes liability for the program? Who makes the decision about which treatment method to use in a specific area? What criteria will be used to determine which treatment methods will be used in each specific area?

40 CFR 1502.17 requires that the names and qualifications of the principle authors of the EIS be listed.

Thank you for you consideration of these comments.

Sincerely,

Michael McPhail

Michael McPhail

United States Department of the Interior
OFFICE OF THE SECRETARY
PACIFIC NORTHWEST REGION
500 N.E. Multnomah Street, Suite 1692, Portland, Oregon 97232

September 17, 1979

ER-79/696

Colonel John A. Poteat
District Engireer
Seattle District, Corps of Engineers
P. O. Box C-3755
Seattle, Washington 98124

Dear Colonel Poteat:

We have reviewed your draft environmental impact statement concerning the Aquatic Plant Management Program for the State of Washington and have the following comments for your use in preparing the final version of this document.

General Comments

We have reviewed the subject draft and find it to be well written and comprehensive in its coverage of the subject. It appears that the selection of a treatment program for selected high use areas (Section 6.02.1.2) coupled with a prevention program (Section 6.02.2) is the best choice from the alternative scopes of treatment (Section 6.02). As pointed out in Section 6.02.1.1, eradication of the Washington State watermilfoil infestation is neither practical nor attainable. However, containment of spread to uninfested waters should be prosecuted at the highest levels possible under the two approaches. The potential for economic and environmental losses to Washington State and the Pacific Northwest from spread of this exotic plant are immense. The following general information is provided as an explanation to the Corps of Engineers of the Bureau of Reclamation's activities in response to the appearance of the watermilfoil problem.

The Bureau has been operating a surveillance and survey program since 1977. They have also developed posters which warn the public of the hazard of transporting fragments of the weed on recreation equipment. These signs have been maintained during the 1978 and 1979 at boat ramps and recreation areas on all water bodies having infestations. The public information efforts have also included distribution of pamphlets describing the weed and the hazard from it, and slide talks to civic groups and clubs. The Bureau of Reclamation will also undertake an environmental assessment of the impacts of proposed treatment

activities prior to initiating a program. The Bureau recognizes that eradication of its infestations is not attainable. However, through integration of various control measures, it is hoped that impacts on high-use recreation areas can be prevented and containment of spread to other water bodies can be achieved. Water level fluctions to dry and freeze established populations will be used within limitations imposed by other uses of the reservoirs. There are early indications that this effect is responsible for elimination of some infestations during the 1978-79 winter season. Plans are being made for a drawdown of Banks Lake during the 1980-81 winter season. Herbicidal treatments to supplement control from drawdown will be used as registrations permitting use in irrigation water become available. The Bureau is preparing an application to the Environmental Protection Agency for an experimental use permit for two formulations of 2,4-D. Data obtained from the experimental work will be used to apply for a water tolerance applicable to irrigation water reservoirs and registrations for use of the pesticides in such sites. The Tennessee Valley Authority already has such special registrations for use of 2,4-D in their reservoirs. However, the EPA has ruled that these labelings are not applicable to western waters. Where adopted, mechanical and contact herbicide practices may be used in critical areas. Consideration has been given to use of fragment barrier screens in wasteways which do not dry up in winter and thereby harbor perennial stands. Information to date indicates the weed will not be a problem in the Columbia Basin Project distribution system. The canals and laterals are dewatered for about five months of the year which exposes an established milfoil crown to drying and freezing. Secondly, the irrigation districts, which operate the system, must carry on a comprehensive herbicidal treatment program for control of many other species of aquatic weeds, and the milfoil must be adversely affected by these treatments also.

There are at least two other kinds of sites in which heavy milfoil infestations will have adverse effects. Constructed drains which carry surface wastewater and flows from buried pipe drains in farmland must be kept clear of obstructing vegetation. Otherwise, there is not sufficient capacity in them and the heightened water surfaces may prevent proper functioning of the tile drains. Lands which have been developed and drained at substantial costs may be lost from production. Eurasian watermilfoil may successfully over-winter in drains that have constant flows.

Should watermilfoil spread to many of the small impoundments on the Columbia Basin Project, it could have adverse effects on recreational and fishery uses. Also, where irrigation pumping plants are located on such perennial water bodies the vegetation debris produced from heavy stands could impact operation and maintenance of the facilities.

The statement should also include information on typical ground water conditions relative to the interrelationship of the ground and surface water regime so that the potential for ground water recharge from treatment areas can be evaluated.

Specific Comments

Section 1.03.1. This section gives the distribution of Eurasian watermilfoil in Washington State and cites Figures 2 and 3. Figure 3, the map of Central Washington, contains some inaccuracies in its depiction of the Bureau of Reclamation's Columbia Basin Project main irrigation channels. The Project is preparing a map showing the correct location of waterways and infestations. It will be sent directly to the Corps of Engineers, Seattle. In addition, two small infestation sites in the Project area are not shown; these will be added. The following information is given in case additional explanation regarding the Project infestation is desired in the statement. At the present time Eurasian watermilfoil has been identified at seven separate sites on the Columbia Basin Project. The largest of these in in Banks Lake. The others are: Billy Clapp Lake, Winchester Wasteway, Stan Coffin Lake, Evergreen Reservoir, Scooteney Wasteway, and Scooteney Reservoir. Of these latter six sites, only Stan Coffin Lake and Evergreen Reservoir have well established infestations. The others have been limited to minor or transient infestations by winter season water level drawdowns which have had adverse effects on the plants. For example, even though a few watermilfoil plants were found in Billy Clapp Lake and Scooteney Reservoir in 1978, none were found during examinations in June and August 1979. The Columbia Basin Project has operated a survey program since 1977 to maintain surveillance of known infestations and examine Project waterways, ponds, and reservoirs for new infestations. Acreage estimates for each site can be furnished if desired.

There is a possibility for misunderstanding of the applicability of the control program to the infestations on the Columbia Basin Project. As stated above, Section 1.03.1 mentions that there are infestations in eastern Washington. The reader is referred to Figure 3 which is the map of Central Washington. The Bureau's infestations are flagged on it.

Section 1.05. This section discusses the proposed Bureau of Reclamation's treatment areas for 1980. Though there is no discussion of plans for the Columbia Basin following the specific plans for each area in western Washington, we believe the casual reader may assume that the program will also be applied to the Reclamation infestations. It is not until Section 3.01, Federal Projects, page 46, that it is stated the program is not applicable to water areas of projects of the Corps of Engineers or other Federal agencies. Later, in Section 6.02.1, within Alternative Scopes of Treatment, page 68, item (4) also states that the subject

Management Program cannot be applied to the infestations under jurisdiction of the Bureau of Reclamation. In order to avoid any misinterpretation, we believe this distinction should be explained earlier in the statement. Section 1.05, Proposed Control Program, should be amended to explain clearly that the Columbia Basin Project infestations are excluded and will be handled by the Bureau of Reclamation within its operation and maintenance responsibilities. We attach a copy of a newspaper article from Wenatchee World dated July 24, 1979, which illustrates this point. The third paragraph states that "the Corps of Engineers also is proposing to attack colonies of the water plant at five spots in the Columbia Basin:..."

Sections 1.04.5, 1.06.1, 1.06.2, 2.03.7, and 4.04.5.1. These sections address the suitability and efficacy of the use of 2,4-D for control of watermilfoil, recommendations that it be used for spot treatment in Lake Osoyoos and the Okanogan River, and the necessity that precautions be taken to prevent contamination of water used for irrigation. The Oroville-Tonasket Irrigation District, which is contractually associated with the Bureau of Reclamation, has two pump intakes from Lake Osoyoos and six from the Okanogan River.

The Bureau of Reclamation recommends that no 2,4-D treatments be made within one-half mile of the irrigation water intakes on Lake Osoyoos to minimize any potential for contamination by 2,4-D residues. A water sampling and analysis program should be instituted in connection with any treatments made in order to obtain information on the levels of residues and their persistence and fate. When adequate data has been accumulated to show that probable levels from operational treatments are within acceptable tolerances the distance restriction could be reduced or dropped.

The Bureau of Reclamation further recommends that no 2,4-D treatments be made in the Okanogan River until data from the residue work in Lake Osoyoos is available and sufficient study is made of the river to predict probable levels and behavior of residues.

Section 1.07.2. Discussion of chemical control does not include any provision for removal of treated aquatic vegetation decomposing in the water. Some treatment areas could have a greater persistence time for detectable levels of herbicides than those reports for some closed-water systems (59 days) and sediments (37 to 161 days) following treatment (app. A, p. A-2). Removal of decomposing vegetation, especially from treatment areas which also may be subject to herbicide drift, should be considered.

Please let us know if we can be of further assistance.

Sincerely yours,

Charles S. Polityka

Charles S. Polityka
Regional Environmental Officer

Attachment

Federal agency plans attack on NCW milfoil

Wenatchee World July 24, 1979

By DAVE REA
Wenatchee World staff writer

A federal program of cutters, chemicals and catch-screens has been outlined in a draft environmental impact statement on plans to combat Eurasian milfoil next year in the Okanogan River and Osoyoos Lake, and in Grant County.

Public comments are being accepted through August 31 on the draft, copies which are available for inspection in Okanogan County at the Okanogan, Omak and Oroville public libraries.

The U.S. Army Corps of Engineers also is proposing to attack colonies of the water plant at five spots in the Columbia Basin: Banks Lake and the Billie Clapp, Evergreen, Crescent Bay and Scottenay reservoirs.

Primary weapons in the fight would be the herbicide 2,4-D and mechanical harvesters.

The report points out that both methods might also destroy animals and other plants. While the report indicates the herbicide 2,4-D presents little or no danger to humans, it calls for "extensive" public notification before use of the chemical to prevent public exposure. As for the cutting program, it says the harvested milfoil may pose disposal problems.

Also proposed are use of a suction dredge, hand pulling and rotovating the bottom of the lakes and river to bring up the plants. A barrier structure is planned in the Okanogan River downstream of known colonies in British Columbia to stop their spread.

Eurasian milfoil, unlike the native milfoil species, grows wildly, fouling beaches and interfering with swimming, fishing and boating. The report said it also may reduce habitat for mature fish and create health hazards by increasing mosquito breeding areas. Without a control effort, the report says, milfoil would spread eventually to the Columbia River and infest all its reservoirs.

The program, to come under a federal-state funding combination, has an estimated cost of $192,600 for Eastern Washington. The corps has calculated annual economic benefits of $334,000 in recreation, land values and the like.

Lakes Washington, Union and Sammamish in the Seattle area also would be treated. That end of the program has an estimated cost of up to $277,000 and first-year economic benefits of $930,000.

Public meetings are being planned on the draft before completion of a final environmental impact statement in September. Single copies of the draft can be obtained by writing Robert Rawson, environmental coordinator, Seattle District Corps of Engineers, P.O. Box C-3755, Seattle, 98124. Written comments on the document can be addressed to the corps' Seattle district engineer at that address.

605 S. 31st Ave.,
Yakima, Washington 98902
Sept. 15, 1979

Lt. Colonel Maxey B. Carpenter Jr.,
Seattle District Corps of Engineers
Seattle, Washington

Dear Sir:

This past week we received a copy of the draft Environmental Impact Statement for Aquatic plant Management. An enclosed letter indicated that you desired comment by August 31, 1979. Since it arrived so recently, it was manifestly impossible to meet this deadline.

The Yakima County Audubon Society with a membership of 235 persons would strongly recommend that you defer the use of chemicals such as 2,4-D or its derivatives in the proposed millfoil control program. We believe that the possible longrange effects of such chemical applications, particularly to the state's water resources, could prove to be a costly and even dangerous mistake.

We do urge that a comprehensive program of mechanical controls be given a thorough test before other methods of control are considered.

Respectfully yours

Fred H. Weathery

Conservation Chmn. Yakima County
Audubon Society

King County, State of Washington
John D. Spellman, County Executive

Department of Budget and Program Development
Mary Ellen McCaffree, Director

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Room 400, King County Courthouse
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John M. Rose, Manager
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September 20, 1979

Lt. Colonel Maxey B. Carpenter
Department of Army
Seattle District-Corps of Engineers
P.O. Box C-3755
Seattle, WA 98124

Dear Colonel Carpenter:

Thank you for the opportunity to review the draft environmental impact statement for the Corps' Aquatic Plant Management Program. We are encouraged by the proposed program and hope that it can be a catalyst for implementation of an effective areawide aquatic plant management program.

The Seattle District is to be commended for the flexibility it has shown in allowing local sponsors to choose from alternative control techniques. We feel that this feature of the program's design reflects a sensitive recognition of local needs and concerns. It is also hoped that the Corps will recognize that local governments need to have some flexibility in designing that portion of the control program which will comprise the local match. For example, we believe that plant control undertaken at public expense on public beaches and in non-navigable waters should be considered as eligible activities for purposes of providing local match. We believe this would facilitate the establishment of an areawide program. Such a program may be the only manner in which this problem can be addressed in a comprehensive and equitable way in either navigable or non-navigable waters.

The public Brochure of the Aquatic Plan Management Program, published in August, states on page 15, that the non-Federal sponsor must agree to hold and save the United States free from claims that may occur from control operations. Although such a "hold harmless" clause may be commonly included in grant agreements prepared by the federal government, it should be recognized that the use of herbicides as a control operation produces a particular problem. The conditions and restrictions concerning the herbicide label are Federal requirements and the license for herbicide application and control are State responsibilities. It therefore appears unfair to ask or require the local government sponsor to assume liability for actions and their implications which are clearly beyond their control. It is hoped that

special consideration will be given to this concern so that herbicides aren't eliminated as a potential control technique solely because of a legal technicality.

Portions of the technical discussion on herbicides appears to need expanding and clarification particularly with respect to Section 4.06.5.2 on page 57. The statement that Endothall, Casoran and Diquot toxicity to fish is dependent upon chemical formulation and the species of fish is not questioned. However, the statement that "No fish kills due to toxicity of the chemical should result from concentrations used to treat milfoil," is misleading. Elsewhere the statement is made that "Dimethylamine salt of endothall is not recommended for use against Milfoil in Washington because of its high toxicity of fish." (Page 65, Section 6.01.6) In addition, fish kill can result from concomitant stress and oxygen depletion in areas that have been treated with herbicides.

Appendix A, Table 1 lists acute toxicity values and references for a number of species tested. However, there is a noticable paucity of local species. Similar information concerning carcinogenicity, teratogenicity, mutagenicity and developmental toxicity effects of the subject herbicides were not included.

Section 3.03.1, Page 46, recognizes that structural methods of aquatic weed control may require Substantial Development Permits as defined by the Shoreline Management Act of 1971. The application of herbicide for weed control also imposes restrictions upon public use of treated areas. Therefore, King County and other jurisdictions require substantial development permits for herbicide application.

We look forward to a more thorough review of the program upon receipt of the Design Memorandum which we hope will help us better understand the cost-benefit analysis, criteria for selecting control methodologies and areas of application, and the constraints on local sponsorship. In addition, further review will result from management analysis conducted through the Union Bay Milfoil Demonstration Project, in which King County is participating.

Again, thank you for the opportunity to review the draft statement and we look forward to a continuing working relationship with the Seattle District on this important program.

Sincerely,

Mary Ellen McCaffree

Mary Ellen McCaffree, Chairman
Environmental Impact Committee

MEM/pt
cc: Bob Matsuda, METRO
Lynn Kay, City of Seattle

FRIENDS OF THE EARTH

25 October 1979

Walter L. Farrar, P.E.
Chief, Regional Planning
Seattle District
U.S. Army Corps of Engineers
P.O. Box C-3755
Seattle, Washington 98124

Dear Mr. Farrar:

Your letter of 17 October 1979 made available to us a document identified as "a draft copy of the aquatic plant management program design memorandum for the State of Washington." The document carries an October 1979 date and your letter indicates that it was prepared after the public hearings of early September 1979. Your letter also invites further comments on the draft environmental impact statement (EIS) for the same program, if they can be provided by 26 October 1979.

This letter constitutes our further comments. These comments are, of necessity, very brief and cannot be considered to be more than partially representative of some of our major concerns about the process to date, the draft EIS, and the design memorandum. We note that the design memorandum is approximately one inch thick. Regardless of content, it is inappropriate to provide citizens with a document of such bulk and then allow them only slightly more than one week to review it and submit comments about it in relation to another document. In this case, since the material involves a project with somewhat complex ramifications and appears to be part of the foundation for statements made in the draft EIS, we feel that what has occurred may very well be a fatal flaw in the normal public review process for a draft EIS.

Comment number 21 in G.M. Zemansky's letter of 10 August 1979 (commenting as a private citizen on the draft EIS) noted that the "benefit/cost analysis" presented in the draft EIS was in fact an unsupported assertion rather than an analysis. According to the draft EIS the methodology and derivation (i.e., the entire technical rationale) for the benefits and costs was "included in the Design Memorandum". Obviously, it was not in the draft EIS even though such information was critical to determination of the basis for and the validity of the limited information in the draft EIS. In response to Mr. Zemansky's freedom of information request, James F. Walsh (District Counsel for your office) sent an "(un)staffed" and "(un)approved" version of the design memorandum with an August 1979 date on the cover. Mr. Walsh's letter of 29 August 1979 was the cover letter and the notation on the document itself was made on 31 August 1979. That document was sent to Alaska and, due to mail delays, was not received until October 1979. We note that there are significant differences between the August and October 1979 versions of the design memorandum (precisely what all the differences are we cannot say since we have had insufficient time for review) and that neither document was made available to the general public during the announced public comment period for the draft EIS. As

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far as we know, Mr. Zemansky was the only citizen who managed to obtain a copy of the August 1979 design memorandum and in his case the document was obtained after the close of the draft EIS public comment period (i.e., in October 1979) and only as a result of a freedom of information request. This despite the fact that other citizens and agencies recognized the critical importance of the design memorandum with regard to the draft EIS, had requested copies of it, and had been promised copies of it. For example:

1. As stated in Rodney G. Proctor's comments on the draft EIS for the Municipality of Metropolitan Seattle (Metro) of 3 August 1979 -

> "The DEIS frequently refers the reader to the Design Memorandum for more detailed and specific data or explanations concerning major elements of the proposed control program and its impacts. The Design Memorandum is not included with the DEIS and it is our understanding from discussions with COE staff that it will not be available for public review prior to the end of the public review period on the Draft EIS. However, review of the Design Memorandum is necessary to more clearly understand such elements of the program as the basis for the cost/benefit analysis, the process proposed for selection of control methodologies, the criteria proposed for selection of control areas and the proposed system for prioritization and funding of site-specific control programs in subsequent years."

2. As stated in Tom Eckman's comments on the draft EIS for the Cascade Chapter of the Sierra Club of 5 September 1979 -

> "The cost/benefit analysis hardly deserves the name, it is so lacking in substance. We are told that more data is contained in the Design Memorandum, but this document was not available to the public for review during this comment period. How are citizens and elected officials to make competent choices when the information they need on which to base those choices is not available?"

3. As noted by Wilma Anderson in her comments on the draft EIS for the Seattle Audubon Society of 13 September 1979 -

> "We were promised a copy of the Design Memorandum; however, at this writing it has not been received."

4. In his comments on the draft EIS of 14 September 1979 for the Northwest Office of Friends of the Earth, Michael McPhail notes the importance of the design memorandum, its unavailability to the public, the necessity of law that it be available to the public, and requests "that a formal public comment period be established for the Design Memorandum."

We do not consider that the present situation is responsive to that request. We would like to know precisely what was the distribution and the time frame of distribution of both the August and the October 1979 versions of the design memorandum to members of the public and involved government agencies.

The following comments are keyed to specific areas of the October 1979 design memorandum (comments relevant to these areas may already have been pointed out in past submittals whether or not mention is made of them herein):

1. Page 1-5 - Waterways Experiment Station (WES) large scale operations management test (LSOMT). As a result of our request to Colonel Moraski on 12 October 1979 you sent us a "working draft" of the LSOMT "test plan" which was received on 17 October 1979. Although we have not had sufficient time to review that document in depth yet, we note that the purpose of that three year "study" which commenced this summer is "to evaluate the concept of prevention as an operational technique for managing problem aquatic macrophytes in the Seattle District." It is further stated in that document that the WES has:

> "discovered that not enough is known about aquatic macrophyte establishment and spread to design an operational prevention plan, nor are sufficient data available to confidently determine the magnitude of the potential Eurasian watermilfoil problems in the naviagable waters of the State of Washington."

In view of the above statement, it seems inappropriate for your agency to even consider a "prevention" program at this time let alone include such a program under the coverage of a draft EIS for near-term implementation. This problem is highlighted by other deficiencies in the draft EIS regarding the "prevention" program in the Columbia River drainage. Mr. McPhail's letter for the Northwest Office of Friends of the Earth on 6 September discusses this situation.

2. Page 1-5 - Metro. Mention is made of Metro's "demonstration project". Absolutely no mention is made of how the information generated during that study (most of which is still not available even in draft form) will be utilized to influence the "control" program. Mention of this aspect of the situation was made in several places in Mr. Zemansky's comments of 10 August 1979. Since Metro is the likely "local sponsor" of any such "control" program in the Seattle area, as the appropriate governmental agency, this failure in coordination is difficult to understand. Your agency has known for at least the last year and one-half that Metro's "demonstration project" would not yield final results and a decision until December 1979; however, your process is taking place in advance of that time.

3. Page 2-1 through 2-2 - Existing conditions and potential for milfoil growth. Although various figures are given for estimated milfoil occurrence in various bodies of water and potential acreage that <u>might</u> support milfoil growth, no indication is given of the fluctuations that have occurred in recent years (i.e., both increases and decreases in extent of plant coverage with no indication that milfoil might increase to the level indicated on page 2-2) and the basis for the potential areas given on page 2-2 is highly suspect. For one thing, the factors which were explicitly listed do not include wave action effects and other factors that are known to influence milfoil distribution. It is likely that a much smaller area would define the real potential maximum and since milfoil growth dynamics are so imperfectly known that milfoil coverage may even be declining in Seattle area waters. For example, the 250 acres indicated in the design

memorandum for milfoil growth in Lake Sammamish in 1978 is a decrease of 125 acres (fully 50 percent of the remaining growth) from 1977 conditions (Goodpasture, J.M., et al., 1978, "Distribution and Community Composition of Aquatic Macrophytes in Selected Waters of King County", Metro, Seattle, p. 71). The design memorandum neglects to put the situation into the perspective of reality by mentioning such facts which are in the same reference relied upon for other information that is mentioned. The unsubstantiated claims with regard to potential for milfoil growth in the Columbia River basin are also suspect.

3. Page 4-14 - Proposed plan for Seward, Madrona, Pritchard, and Lake Sammamish beaches. In the case of the city of Seattle beaches no information has been presented to indicate that milfoil in fact grows at any of them or, if it does, how much of a problem it might be. Similarly, with regard to Lake Sammamish, the available information would not indicate that the small amount of milfoil in the vicinity of the beaches and boat ramp is a problem (further discussion of this point is presented in Mr. Zemansky's letter of 10 August 1979 with regard to pages 16-28 of the draft EIS, comment number 20). Furthermore, the city of Seattle has already acted to utilize bottom screening techniques for any aquatic plant problems (such as water lillies) that might exist at its beaches. Although the relevant portions of the Metro demonstration project have not yet been published it is known that bottom screening was highly satisfactory at those beaches during 1979, their first year of use (Personal communications with Dr. M. Perkins, University of Washington, Principal Investigator for the Metro sponsored study, October 1979).

4. Pages 4-20 through 4-22 - Chemical control impact assessment. The presentation is facile and totally inadequate. No documentation to support various claims is given. Problems such as toxicity to salmonids are downplayed with qualifications that attempts will be made to "avoid high-use areas during spawning, rearing, and migration." Besides problems in the identification of such areas (limited by the rather imprecise state-of-the-art of the biological sciences), such areas were not identified in the draft EIS or the design memorandum (only general reference is made to such areas and the presence of salmonids in various areas proposed for treatment in the U.S. Fish and Wildlife Service letter of 2 July 1979 under George L. Capp's name and appended to the design memorandum), there is the question of drift, which is also not dealt with in those documents. Furthermore, various important aspects of toxicity such as interference with smoltification are not discussed. The absence of information is defended with the statement on page 4-22 that "Chronic toxicity should not be a problem". Data to positively support that statement are simply not presented (a general failing of both the draft EIS and the design memorandum).

5. Appendix A - "Detailed cost estimates". First of all, the information on costs presented is totally unsupported. What is the basis of the numbers given? No references are listed, although it appears that enough of the assumptions are explicitly stated to determine how the calculation was made once numbers were picked. What is the basis for stating that harvester rental amounts to $480 per acre? Total harvesting costs in other parts of the country and Canada have been far less than that amount which assumes two cuttings and a per acre cost of $240 per cut. Similarly, disposal costs are unsubstantiated. Local administration, Washington Department of Ecology (DOE), and Corps management costs total $310 per

Walter L. Farrar
25 October 1979
Page 5

acre, or about double the high cost in eastern Canada when contracted out to a profit making firm... just for administration here? In the case of chemical treatment, there is an unexplained and significant variation in local administration and DOE costs. Local admininstration costs which were stated to be $40 per acre for mechanical harvesting are $20 per acre for all of the chemical methods while DOE costs of supervision vary from $155 to $205 per acre ($155 for the purported "low cost" 2,4-D granular BEE formulation) for the various chemical methods as compared to $190 for mechanical harvesting. Why? Does it really cost less for local administration and DOE supervision of a 2,4-D BEE program than a mechanical harvesting program? Corps management costs seem to stay the same in all cases. Furthermore, we are skeptical of the actual costs cited for 2,4-D BEE application per acre and in view of the fact that chemical treatment efficiency (as demonstrated in Lake Washington this summer) may be so low as to require two treatments it would probably be appropriate to specify that two treatments are necessary in defining costs. There is as much a possibility that only one harvesting and two chemical treatments might be required to accomplish the job as the other way around which you have assumed. On that basis, using your numbers with the assumption that two treatments are necessary and that program administration costs at least equal those with harvesting an estimate of $660 per acre is obtained for 2,4-D BEE, your "low cost" method. With regard to fiberglass bottom screening, we also question the basis of your numbers. In particular, why is the cost of DOE supervision so high ($840 per acre) and why wasn't the fact taken into consideration that the bottom screens may last ten to fifteen years and that therefore their costs must be amortized over that time me to arrive at a comparitive annual cost? Using the low end of that scale and crudely dividing the total by it and adjusting the DOE supervision and local administration costs to those of mechanical harvesting a per acre cost of $1,300 per acre is calculated (the low end estimate yields a high end cost estimate that might actually be substantially lower). Although the Corps' proposed monitoring and evaluation program is not discussed and therefore cannot be evaluated, it is reasonable that it is much higher for chemical methods than for non-chemical methods, and it may even be more lopsided than is shown given the Corps' bias. Accepting the Corps' figures of $33,000 and $3,000 respectively chargeable to chemical and non-chemical methods the per acre cost for each in this 100 acre program is $330 and $30. Using the Corps' "low" and "high" cost assumptions (i.e., 2,4-D BEE over 100 acres as opposed to mechanical harvesting of 90 acres and bottom screening of 10 acres and using the Corps' evidently high mechanical harvesting figure and our adjusted chemical figure) the comparison is as follows:

Mechanical Harvesting/Bottom Screening -	$96,100
Chemical (2,4-D BEE) -	$99,000
Excess Cost of Chemical Over Non-Chemical -	$ 2,900

In other words, it may very well be that a well run program of mechanical harvesting and bottom screening would result in substantial savings of public monies in comparison to the lowest cost herbicide alternative.

6. Appendix B - "Detailed benefit analysis". As already stated, the information to determine city of Seattle beach impacts and therefore benefits doesn't

appear to exist. In any case, it would appear to be immaterial unless the Corps is proposing to pay the city for the bottom screens which it has already purchased and successfully used. Similarly for Lake Sammamish State Park, whatever problem there is at that location doesn't appear to be related to milfoil at this time. Therefore, the very large benefits which are estimated to be the result of control program action at Lake Sammamish State Park (about 82 percent of total control program estimated benefits) and the city of Seattle beaches (an additional 6 percent) are essentially non-existent. Further comments are hardly necessary with regard to the meaning of that. It is noted that there has been a substantial change in benefit estimation since the August 1979 draft of the design memorandum At that time a figure of 100 percent reduction was used in the event of no control program. In the October 1979 version, a figure of 50 percent reduction was used. Therefore, the estimated benefits vary accordingly for those situations. Accepting the Corps' figures for the other beaches as given in the design memorandum yields benefits attributable to the control program at them of $70,308. Having insufficient time to further evaluate that situation we will proceed. In the design memorandum benefits from a control program for areas which are not public beaches are given in terms of purported "willingness to pay". Who would pay for what? Insufficient information is given in the design memorandum or the draft EIS to determine precisely what the benefits are and equally importantly from a public policy standpoint how they would be distributed. Benefits for the prevention program are equally suspect. Benefits are claimed for the Columbia River basin almost all the way to the Pacific Ocean. Previous comments herein with regard to the LSOMT and the likely potential distribution of milfoil are relevant.

In summary with regard to benefits and costs, the information in the design memorandum and the draft EIS is inaccurate, misleading, and insufficient with which to complete the calculation of a usable benefit-to-cost ratio. With the available information and given the time constraints we have been working under, it would appear that the costs of the lowest cost chemical method are <u>more</u> than the costs of a reasonable mechanical harvesting-bottom screening alternative and that the benefits may or may not be greater than the costs but if they are greater it is not by very much (for a control program). The presentation of both benefits and costs in the design memorandum and the draft EIS for a "prevention" program appears to be more in the realm of fantasy than anything else and, in our opinion, is unusable. Furthermore, in any chemical control program any possible recreational benefits would have to be adjusted downward to reflect loss of recreational opportunity to safety restrictions against use and entry.

Due to time limitations we are forced to cut short our comments at this point, without having completely reviewed the design memorandum of October 1979. However, two other brief comments are appropriate at this time:

1. Colonel Moraski's letter of 12 October 1979 fails to provide answers to the questions asked by Mr. McPhail in his presentation of 4 September 1979 at the public hearing in Seattle. The responses politely side-stepped the questions or provided information which we feel is insufficient to address the problems raised by the questions; and

2. Via our freedom of information request of 26 September 1979 we obtained copies of several very pertinent documents from the Corps. One of these is the memorandum of 29 August 1979 of David Chawes and Judith Petersen and the attached

enclosures regarding public health risks (primarily carcinogenicity and teratogenicity of 2,4-D is discussed) and monitoring/public notification/employee safety requirements. Quoting from those documents:

> "Many of the statements (in the draft EIS) concerned with the teratogenicity and carcinogenicty of 2,4-D are inaccurate, incomplete, and/or inadequately referenced."

> "It is the opinion of the industrial hygienists for the Seattle District and the North Pacific Division that the U.S. Army Corps of Engineers should not be a proponent of the use of 2,4-D as a means of aquatic plant control in waters used by the public for recreational and agricultural purposes."

> "Strong evidence exists that 2,4-D causes birth defects in animals and there is accumulating evidence that it also causes cancer. The EIS does not adequately address the possibility of adverse public health effects resulting from the application of 2,4-D to public-use waters."

As noted in a Seattle Post-Intelligencer editorial on 15 October 1979, it is obvious that the Corps has been a proponent of 2,4-D use for some time. The Corps has made no secret of that and everyone is aware of it. The question is why? Particularly in the face of solid and growing scientific evidence and empirical correlations that 2,4-D poses a serious public health risk and that there are economically viable alternatives. If the Corps doesn't take the recommendations of its own Safety Office industrial hygienists on what authority does it rely for decision making evaluation with regard to public health risks?

Furthermore, the Safety Office industrial hygienists have also raised important questions with regard to monitoring, public notification, and employee safety. Besides the fact that it is a label violation to put toxic chemicals like 2,4-D into the water supply (i.e., water used for irrigation and domestic purposes) that the lakes involved are, what about the health of those persons effected and the protection of the aquatic environment? There is no indication in either the draft EIS or the design memorandum that the Corps is willing to take steps to even identify lake water users like Mr. and Mrs. Favro let alone measures to protect their health and comply with the minimum legal requirements relating to such situations.

We would appreciate your timely response to the substantive points of these comments. We would also appreciate your providing us with copies of all comments on this matter submitted by the U.S. Fish and Wildlife Service, Washington Department of Fisheries, Washington Department of Game, King County, Metro (subsequent to August 1979), and the city of Seattle (with the exception of any that appear in the design memorandum of October 1979).

Sincerely yours,

G.M. Zemansky and Michael McPhail

METRO
Municipality of Metropolitan Seattle

Exchange Bldg. • 821 Second Ave., Seattle, Washington 98104

October 25, 1979

Mr. Walter L. Farrar, P.E.
Chief, Regional Planning
Department of the Army
Seattle District
Corps of Engineers
P. O. Box C-3755
Seattle, Washington 98124

Dear Mr. Farrar:

Thank you for the opportunity to review the Seattle District, U. S. Army Corps of Engineers (COE) draft Design Memorandum (DM), which we received on October 17, 1979. We are particularly pleased with the provision for control program monitoring and evaluation which, as we understand it, will be the mutual responsibility of the COE and Washington State Department of Ecology (DOE).

Our previous comments on the COE Draft Environmental Impact Statement (DEIS; July, 1979) were contained in the August 3, 1979, letter to Lt. Colonel Maxby B. Carpenter and were in particular reference to the necessity of review of the Design Memorandum. Accordingly, our subsequent comments address the particular elements of the proposed Aquatic Plant Management Program outlined in the August 3 letter.

Cost Analysis

Based upon the information contained in the Design Memorandum, a number of questions still exist concerning the Cost/Benefit analyses.

In regard to the Union Bay Research Demonstration Project, the costs associated with mechanical harvesting and the use of "Aquascreen" have not yet been finalized. However, the project staff will continue to work with COE personnel as that information becomes available. It is presently anticipated that Metro's cost data will be available in November, 1979.

According to the information contained in Appendix A, costs for each treatment method are based upon the following: October, 1979, price levels, including contractor's cost; administrative costs of local government; DOE supervision and COE management. It is tempting to compare the per acre cost estimates, but this is difficult to do for a number of reasons: front end costs have not been amortized, nor have annual costs been projected into the future; the local administration costs are probably optimistic and too low; the DOE supervision costs, however, seem unreasonably high for some control techniques; and the monitoring and evaluation costs were not included.

It is unclear why the per-acre costs of DOE supervision vary so much for each treatment method given, especially since local administration and COE management costs remain constant. We are particularly interested in the basis used for the cost of DOE supervision for the use of fiberglass bottom screen (i.e., $840/acre).

In addition, the distinction between DOE Supervision/COE Management and Program Evaluation and Monitoring is unclear. Although separate costs are given for each of these program elements, the program aspects for each of these activities are not well defined. The local sponsor(s) may want to be actively involved in the design and performance of the work.

Since the benefit analysis is tied so closely to the selection of control areas, we will raise our concerns about the analysis in the following comments on the selection methodology.

Selection of Control Methodologies and Criteria
Proposed for Selection of Control Areas

It is unclear in the DM whether the COE intends to allow local sponsoring agencies the flexibility to propose other areas in selected water bodies for treatment in 1980. The benefit analysis indicates that other areas could benefit from milfoil control based on recreational usage. The COE DEIS contains the general statement that "economic justification for the control program is based on the prevention of recreation loss (swimming and beach activity) for the public areas to be treated," (page 28) and implies recreational benefits were the primary criteria for selecting areas in Union Bay for control.

However, regarding the shoreline areas in Union Bay selected for control, the DM states that "the selection of a 100-foot-wide channel width is based on the objective of providing adequate navigation access while minimizing environmental impacts."

Mr. Walter L. Farrar
October 25, 1979
Page Three

Since the shipping navigational channel does not require control, it seems that the primary treatment area selection criteria for Union Bay is to promote recreational navigation and restore areas to usage levels desired by the public. The present proposal for Union Bay would not fully restore recreational use of the area, nor does it propose a channel all the way along the shoreline to facilitate circumnavigation of the bay. We would appreciate a better understanding of your specific criteria for identifying only these 17 acres.

Metro staff understands through conversations with COE staff that the COE will consider control methodologies other than those specifically recommended for each area. For example, in Union Bay "Aquascreen" might be considered another fundable control methodology if certain criteria yet to be defined by the COE are met. Metro staff will continue discussions with the COE to clarify this issue.

Regarding the COE recommendations to use 2,4-D in Union Bay, it is unclear whether 2,4-D was recommended over other control chemicals based solely upon its selectivity to control milfoil. If this was the reasoning, please note that according to preliminary information received from the literature review conducted as part of the Union Bay project, non-target plants can be destroyed by applications of 2,4-D if application rates for milfoil control are exceeded.

<u>General Comments</u>

In reference to Table 3-2, Alternative Treatment Methods, in the DM, we offer the following information on harvesting and use of Aquascreen based upon information obtained to date from our Union Bay project.

<u>Performance (Effectiveness)</u>

One of the disadvantages given in Table 3-2 for harvesting was that plant regrowth is stimulated. Initially, the process of harvesting may stimulate growth; but over time, the process eliminates plant nutrients from the water system and allows for effective control.

With regard to Bottom Shading (e.g., Aquascreen), our date indicate that it is 100 percent effective immediately upon application at the beginning of the growing season. Difficulties in anchoring the material may be minimized if placement occurs early in the season prior to extensive macrophyte growth. Lifting of the screens by gas bubbles has not proven to be a problem because the screens are permeable.

Recreation (Water/Non-Water Contact)

The disadvantage given in Table 3-2 for Bottom Shading is that swimming and boating activities could be limited during the treatment period. It should be noted that these activities would be limited only during the installation period.

Navigation (Commercial)

Application of any of the chemicals listed would involve slow-moving boats which "could interrupt or congest navigation routes during treatment operations," approximately to the minimal level created by harvesters. This should be so indicated in the Table.

The literature reviews on the public health effects and aquatic environment effects of herbicide use (2,4-D; endothall; diquat; dichlobenil) should be finalized and published for review by November, 1979. However, we have attached copies of the draft reports prior to finalization in order to assist you. Further information on the selectivity of Endothall can be obtained by reviewing the report submitted by A-1 Spray Services, Inc., on their application of Aquathol K to selected areas of Lake Washington this past summer and DOE's data on the monitoring of the application.

Prioritization and Funding of Site-Specific Control Programs

Neither the draft DM nor the DEIS answer all the questions about this new program, especially the management procedures. We recognize that many of the details remain to be developed, but we have these comments to add at this time.

The DEIS states that local sponsors will submit treatment proposals to DOE for inclusion into the state program. DOE, in turn, would submit the state proposal to the Corps of Engineers. The DM elaborates on DOE's role on pages 4 through 18.

Although we are considering a range of alternatives, one scenario we are considering would have a single agency in the Seattle metropolitan area perform much of this work and provide DOE with an annual list of site-specific treatment proposals. That list would be organized to reflect local priorities. DOE could then submit this list to the Corps of Engineers for funding considerations and the Corps program dollars could be allocated straight down the list, until the funds were exhausted.

We also suggest that DOE coordinate its periodic projections of milfoil growth with the local agencies as well as the Corps. Local sponsors will also need to be included with the Corps as receivers of the DOE results of the monitoring and evaluation program.

If you have any questions, please contact either Kris Holm (447-6610) or Vicki Burkhard (447-6356). Suzanne Schweitzer (447-5883), the Union Bay Demonstration Project Manager, will continue to work with you, WDE, and the other local jurisdictions to get a program under way this next milfoil season. We have attached a copy of our revised schedule. We look forward to the receipt of your final EIS for review and comment.

Sincerely,

Rodney G. Proctor

Rodney G. Proctor, Manager
Environmental Planning Division

RGP:vbg

Attachments

cc: Union Bay Technical Review Committee

UNION BAY DEMONSTRATION PROJECT

DECISION-MAKING STRATEGY & TIME FRAMES

TASK	TARGET DATE
Second cut with harvester	early October
Herbicide Literature Study • medical effects (done, need format) • aquatic environment	late October
Receive preliminary assessment of alternative control techniques from U of W consultant	late October
Receive final assessment of alternative control techniques from U of W consultant	November
Submit analysis of alternatives to Water Quality Committee with recommendations on control technique, lead sponsor and financing mechanism	December 13
Submit analysis of alternatives to Metropolitan Council with recommendations on control technique, lead sponsor and financing mechanism	December 20
Water Quality Committee makes recommendation to Council	January 10
Metro Council makes decision	January 17
Local agency accepts lead role (in accordance with SEPA)	February 1980
Lead agency - • applies for Corps of Engineers 70% cost-sharing program • starts any permit processes necessary • may contract for or buy any equipment, supplies, services that will be needed	March 1980
Local agency ready to take action to control milfoil	April 1980

Seattle Audubon Society

A Washington Chapter of National Audubon Society

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October 26, 1979

Mr. Walter L. Farrar, P.E.
Chief, Regional Planning
Seattle District, Corps of Engineers
P.O. Box C-3755
Seattle, Washington 98124

Re: Design Memorandum - Aquatic Plant Management Program.

Dear Walt:

On October 18th the Army Corps of Engineers Design Memorandum was hand delivered to me with your letter of request for further comments on the Draft Environmental Impact Statement. These comments were requested by October 26th.

There appear to be several changes from the DEIS to the DM; especially on cost-benefit analysis.

At our meeting with you, Col. Moraski, Bob Rawson and Ron Bush on October 12th, we were told that the DM was being revised considerably ("beefed up") over the DM referred to in the DEIS. Nevertheless, we have never seen the original (draft) DM. It was not available to us during the DEIS comment time although we requested it verbally at the public hearing and in our comment letter because points of the DEIS were vitally dependent on that DM.

Now the DM revision comes with a one week review time. The DM revision is virtually a revised draft of the DEIS - or at least a very vital part of it. One week is a woefully inadequate time for review, and it is surely not in the spirit of NEPA.

COMMENTS AND QUESTIONS:

We believe that the question of milfoil/aquatic plant control should be based on alternatives that have least impact on the environment - including the human environment. It is our assessment that the DM concentrates on justifying herbicide use; especially 2,4-D. In our opinion, the cost-benefit analysis epitomizes this point. For example:

-The botton line for 2,4-D does not include monitoring costs, costs of providing alternate irrigation and/or drinking water sources or the possibility of need for second applications.

-The bottom screening cost includes the total price of the item as a first-year cost. What is the second and subsequent years' costs when these items are paid in full? Why aren't these purchase costs amortized over the expected life of the screen? The bottom line does not include the fact that the City of Seattle has already purchased screens for several beaches. This would reduce the cost figures in the DM.

-The mechanical harvesting bottom line does not include the potential for selling the harvested plant. When doubling the 2,4-D lowest cost figure - which might be realistic if 2 applications were required due to adjusted application time for fish - then the total is almost exactly equal to the figure shown for mechanical harvesting.

-What is the justification for the difference in administrative costs for chemicals and other methods? Why would the local administrative costs for mechanical harvesting be exactly double the cost for any others?

-Is it realistic to have a $900/acre bottom screening contingency when mechanical harvesting has $50/acre contingency and the herbicides vary from $35 (2,4-D) to $165/acre? What is the basis for these figures?

-If the Corps is the co-funding agency, the Department of Ecology is the umbrella agency and the local agency does the administering, and if the monitoring and evaluation figures are separate (A-4), then what explains that the local and Corps costs remain the same for all methods while the Department of Ecology varies from $155/acre (2,4-D) to $840/acre for bottom screening?

Although at our October 12th meeting we were told that the Corps has the Metro Macrophyte study indicating rise and fall of milfoil growth in different locations, that knowledge is not reflected in the control proposal for Lake Sammamish. Additionally, we direct you to the Metro finding this year in the demonstration-research project that there was not enough milfoil in lower Lake Sammamish to justify harvesting, and that what was there was not in a location to impact recreation.

It is our understanding that Lake Sammamish is the sole source of drinking water for some residents, and also that for many it is the main source of irrigation water. How would an alternate source of drinking water be provided to these people? How would a community be notified of herbicide applications to either drinking or irrigation water supplies? Would the Corps apply 2,4-D (or any other herbicide) to a drinking water source without providing an alternate supply of drinking water?

Regarding the monitoring and evaluation of herbicides applied - we continue to have questions on how, who, when and what would be monitored. And what would be presented to the general public for assessment?

There is some confusion regarding the part of the Large Scale Operations Management Test (LSOMT) in the state milfoil management program (1-5). If the purpose and scope of LSMOT is to obtain data to evaluate a concept, how can the local Corps be proposing to put these conceptual methods into immediate use before said evaluation?

Although SAS committee members have not seen the written LSOMT proposal, it is rumored to include 2,4-D test plots in the Sammamish River. SAS wishes to go on record by calling for a FULL PUBLIC REVIEW PROCESS of any Corps proposal for herbicides in any Washington waters.

There simply is inadequate time for us to evaluate this Design Memorandum; especially to compare it to the DEIS, find the changes, re-evaluate them and comment in depth. We would suggest that the entire Draft EIS be rewritten as one unit and resubmitted for public comment.

We request that both this letter and our letter of October 14th be considered comments to the existing DEIS.

Again we reiterate that SAS supports non-chemical methods of aquatic plant control. We cannot accept that this proposal be based solely on an economic justification (regardless of what the costs seem to say).

We remind you of our concern about herbicide impact on wildlife - an area not addressed in the DM.

There is growing public concern about the over-use of herbicides, and 2,4-D is the subject of much current conversation on this topic. This is evidenced by the in-house memorandum from the Corps' own industrial hygienists cautioning against the use of herbicides in the aquatic plant management program.

Also you may be aware of the very recent declaration of restrictions on the use of 2,4-D in national forests and a policy to emphasize nonchemical methods of forest management to be put into effect by the U.S. Department of Agriculture. It is expected that these restrictions will be extended to other government agencies.

As we have discussed, and as the DM points out, there are adequate non-chemical methods of aquatic plant control available now.

We encourage the local Corps to conscientiously re-evaluate their proposed use of herbicides and consciously take the lead in proposing a program of aquatic plant control which emphasizes non-chemical methods.

Sincerely,

Wilma Anderson

Wilma Anderson, Chairperson
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Dear Gentlepersons:

Citizens Against Toxic Herbicides appreciates the opportunity to comment on your "Eurasian Watermilfoil" information pamphlet. Before beginning the body of our comments, we wish to enter the following requests into the record:

1. We would appreciate receiving five (5) copies of your draft environmental statement, your rules for administrative reviews, your section of policy manual implementing Council for Environmental Quality guidlines for preparation of environmental reports and statements, the section of your policy manual implementing the Freedom of Information Act (5 USC 552) and the portion of your policy manual that describes rules for filing documents (the index to your filing system). We request the above under the authority of the Freedom of Information Act (5 USC 552). Since this is a matter relating to public health, access to such information is clearly in the public interest, and we therefore request that you exercise your statutory authority under the FOIA to forego any charges for providing such information.

2. We request that you take no further actions regarding this matter without keeping our organization fully informed (when possible, before action takes place).

3. We request that you drop any alternative including the use of 2, 4-Dichlorophenoxeyactic acid, its salts, esters, or amines, based on the information contained herein inter alia.

43 CFR 77 (Thursday, April 20, 1978 at 16807) contained a notice that the Environmental Protection Agency had accepted 2, 4-D as a candidate for an intensive scientific review (RPAR) because risk criteria may possibly be met or

exceeded. The basis of the notice were tests indicating the 2, 4-D may exceed risk or or oncogenicity, teratogenicity, and effects on nontarget organisms.

The wisdom of one federal agency proceeding to use a substance when informed by the agency responsible for regulation of toxic substances that such use may pose a hazard to human health or the environment seems to us as being of questionable wisdom. The possibility of claims under the Federal Torts Claims Act following the use of 2, 4-D should be considered and entered into the Cost-Benefit analyses.

We have included a copy of abstracted studies we have received under FOIA from the National Institute for Occupational Safety & Health. Studies included indicate the following:

1. 2, 4-D is gonadotrophic (lowers sperm counts) at concentrations of 100 ppb.
2. 2, 4-D is mutagenic at 10 ppb.
3. 2, 4-D lowers BOD (available oxygen) in aquatic environments.
4. 2, 4-D's toxicity is synergistic with that of carbamate insecticides (likely to be present in Eastern Washington marine environments), in trout.
5. Principle loss of 2, 4-D from aquatic environments is due to volatilization, not degradation.
6. A TVA study indicating that the use of 2, 4-D to eradicate milfoil was not successful.
7. Low levels of 2, 4-D inhibits the predators of e. coli (Coliform bacteria) in aquatic environments.

We also include a series of documents indicating that sperm counts are falling among the American male population at an alarming rate, and that up to 83 percent of birth defects may originate with male sperm.

We would also like to call to your attention that the September 1978 edition of the Northwest Edition Potlatch Times, reported an interview with Mr. Jack Warren of Dow Chemical U.S.A. in which he reported that 2, 4-D contains 2, 7-dichloro-dibenzopara-dioxin. You should be aware that di-dioxin can convert to Tetra-dioxin (or TCDD) through simple chlorine substitution (such as might occur in a municipal water system).

To our knowledge, 2, 4-D has not been tested for the presence of dibenzo-furans or unsubstituted dibenzo-dioxins. Unsubstituted dibenzo-dioxins can also convert to TCDD, or any of the other dioxins through chlorine substitution or through metabolic hydrolysis.

We were rather shocked that your alternatives do not include a program of prevention through controlling nutrients in the affected area. Cleaning up sewage outfalls, agricultural runoff of nitrates and nitrites, etc., would treat the disease. All of your listed alternatives are merely symptomatic treatments which would result in a waste of taxpayer dollars over the long haul.

Surely the Corps of Engineers can do better than this.

We heartily recommend that your staff read The Other Face of 2, 4-D: A Citizen Report issued by the South Okanagan Environmental Coalition, P.O. Box 158, Penticton, B.C. V2A 6K3, $7.00. You might even consider asking them for permission to adopt that document as the statement on the 2, 4-D alternative, although much new information has become available since the report was issued.

You might also want to consider adopting a program of integrated pest management similar to what the Agriculture and Interior Departments are insituting. For an excellent set of model guidelines, see Forest Service Interim Directives 1-4, FSM 2140.3.

We also would like to call your attention to an article in the January, 1979, edition of BioScience entitled "CAST-Industry Tie Raises Credibility Concerns." We feel strongly that the Council for Agricultural Science & Technology is not a reliable source of information, having research their report and finding it shot through with false, inaccurate, and misleading statements. We would certainly hope that you would not rely on this organization's reports, considering the source of their funding.

We request that the text of our response be printed in your final environmental statement, as required by CEQ Guidelines.

Again, we appreciate the opportunity to comment on your proposal. Should you

desire any further information, please feel free to contact us.

Sincerely yours,

Georgia E Hoglund

Georgia E. Hoglund
Chairperson

GEH:CAS

cc: Gil Zemanski, FOE Seattle

bibliography

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